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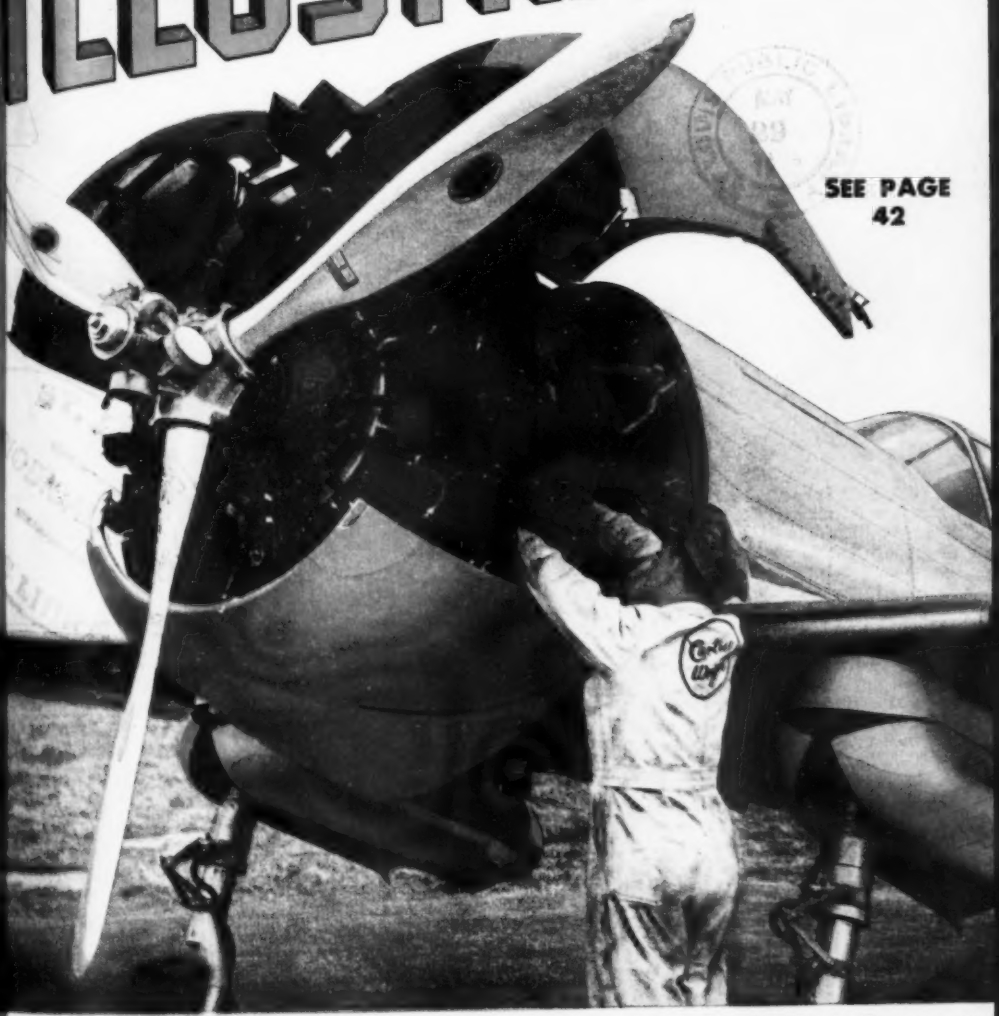
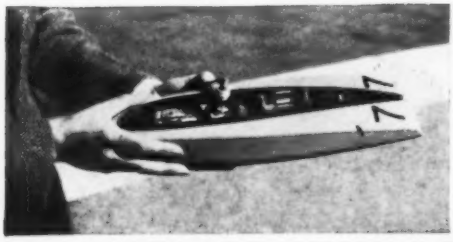


EW PLANES FOR AMERICA!

PORPOISE WITH A PURPOSE!



Ever watched a porpoise frolicking and speeding along on the crest of a wave beside a ship? Next month we're bringing you a porpoise that will act just like that—only of course it isn't a real porpoise. It's a model "pocket" speedboat, powered with one of the new super-tiny gas engines. When you build yours and try it out you'll see why we called it *Porpoise*. A 15-inch bundle of streamlined dynamite, *Porpoise* will skip along at amazing speed, not bothered in the least by choppy water. The engine is protected from flying spray by a smooth cowling. Complete plans and instructions for building this beautiful little boat will be included in the August issue of MECHANIX ILLUSTRATED, so be sure to reserve a copy at your newsstand.

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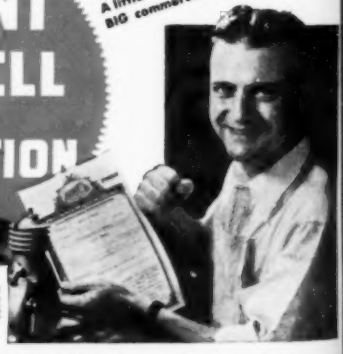

Some of the world's biggest fortunes came from inventions evolved by the "LITTLE MAN" . . . who didn't consider himself an inventor at all. The telegraph was invented by a painter; the typewriter by a farmer; the stock ticker by a dentist; the crinkly hair pin by an observant husband. If YOU have an idea that will save time, save labor or give pleasure, you owe it to your future to find out QUICKLY how you can protect your rights to it! The books shown below may prove invaluable to you . . . send for them NOW!

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the Case of the Crying Wife

1 Ann doesn't cry easily—but that night I found her in tears! "I can't help it," she sobbed. "All the things we were going to do—buy a car, build a home—remember? And here we are—married three years, and just barely making ends meet! I thought our dreams might come true—but it's no use." I made up my mind right then to "have it out" with the boss.

2 "Look here!" he said. "I can't *pay* you more unless you're *worth* more! And frankly, John, you lack the *training* a bigger job needs. Ever hear of the International Correspondence Schools?"

3 When I learned the boss was a former I.C.S. student, I signed up *quick!* And what a difference it made in my work! I'd never realized until then how *little* I knew about the business.

4 I'm happy, and Ann's happy, and I guess the boss is happy. (At least I've had two "raises" in the last year!) And here's the very same coupon that I mailed, staring *you* in the face!

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JULY
1940

Volume XXIV
Number 3

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WHEN the National Soap Box Derby is run off at Akron, Ohio, this fall, we'll be looking for some MI readers to be up among the big winners.

Why?

Because the August issue will contain complete plans and instructions for building the MI Special Soap Box Racer, a streamlined, free-wheeling speed buggy that hits the hills like an eel on a greased slide and has a follow-through on the straightaway that is nothing short of a motorless miracle!

We're doing our part . . . the rest is up to you!

There will be plenty of other practical how-to-build projects besides the Soap Box Racer in next month's issue, along with a generous helping of interesting features, varied news shorts and photographic projects.

The new MECHANIX ILLUSTRATED is on sale at all newsstands the first of every month.

ROBERT HERTZBERG, Editor

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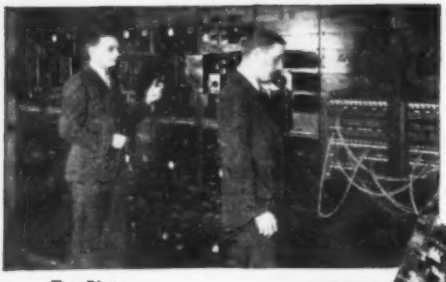
Learning Radio at Home Nights Has Gotten Hundreds Good Jobs

Yes, hundreds of men from all walks of life are in pleasant, well-paying Radio jobs today because they trained at home to be Radio Technicians. These men hold jobs in practically every branch of Radio—installing, fixing, selling home and auto Radio sets; operating and maintaining Broadcast, Police, Aviation, Commercial, Experimental Radio Stations; selling, installing and servicing loudspeaker systems. Newer fields such as Television, Commercial Electronic Devices offer opportunities now and for the future to Radio Technicians.



Why Radio Technicians Get Good Jobs—Earn Good Pay

Anyone can tune a Radio set, but very few can service one; few can operate or maintain a Broadcast Station, or handle the many other types of jobs which require a working knowledge of Radio. That's why so many trained Radio Technicians enjoy good pay, steady work, plenty of opportunities for advancement. And why there are many opportunities to make as much as $5 to $10 extra a week fixing Radios in spare time while training. I GIVE YOU MY PROFESSIONAL ALL-WAVE, MULTI-PURPOSE SET SERVICING INSTRUMENT to help you make good money fixing Radio sets while learning and equip you for full time jobs when you graduate.

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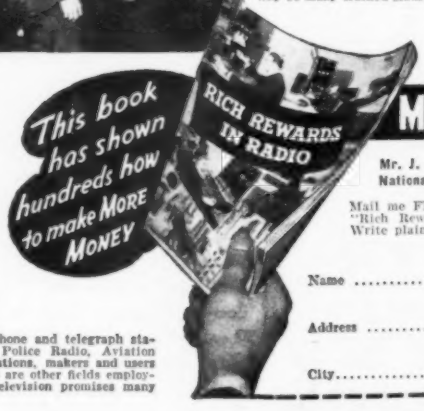
Top Picture
FIXING RADIO SETS in spare time pays many from $5 to $10 a week extra while learning. Full time work for Radio dealers, jobbers or manufacturers, servicing home and auto Radios, pays as much as $30, $40, $50 a week. Many Radio Technicians operate their own spare time and full time Radio Service businesses.

Center Picture
BROADCASTING STATIONS employ Radio Technicians as engineers, operators and pay well for trained men to fill interesting technical jobs with real futures.

Lower Picture
COMMERCIAL RADIO telephone and telegraph stations, Loudspeaker Systems, Police Radio, Aviation Radio, Experimental Radio stations, makers and users of industrial electronic devices are other fields employing qualified Technicians. Television promises many good jobs soon.



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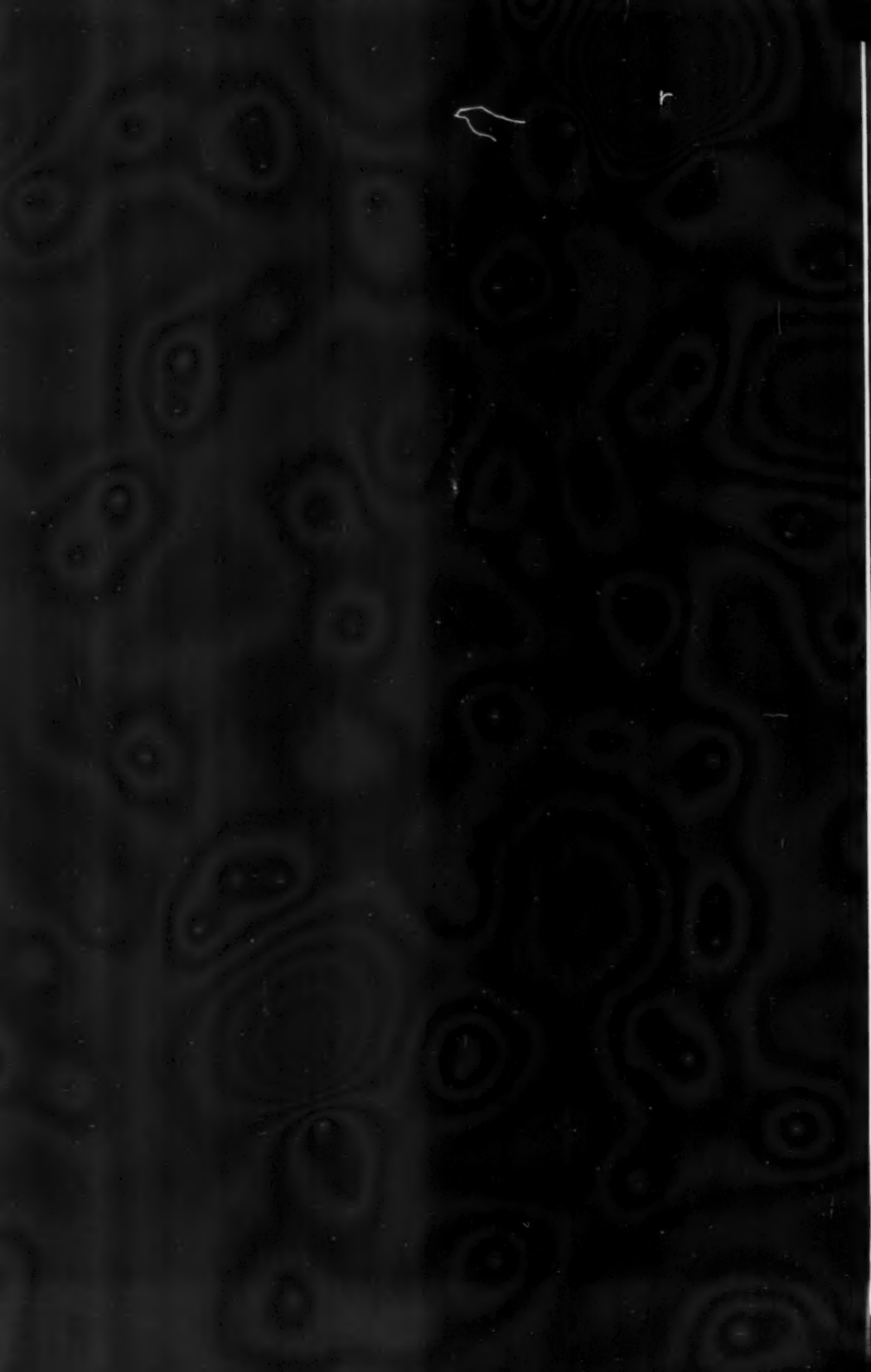

When jobs are looking for men —thats news!

1 Look here, Frank—Two full columns of male help wanted—your kind of work!
Yes I noticed it—Last year at this time there wasn't half that much
2 H'lo, Frank—you're an office man—Do you know where we could get a manager for our Accounting Department?
Gee—I wish I could qualify!
3 You say Mary's husband just got a new job at double his old salary?—That settles it, Honey—the time has come for us to get out of the rut, too. I'm going to write LaSalle tonight!
4 1 year later—
I stayed late at the office, Honey, to get off my last examination paper—now I'm Somebody!
That's swell, Napoleon—here's a letter that came today
5 Honey, look at this!—We're out of the rut at last! Doberry & Co. want me to come and see them—just the job I wanted
And say—am I glad I'm prepared for it!

. . . . . NOW IS THE TIME! . . . . . .

RIGHT now, in many lines there is a search for really *good* men—managers, leaders—men who can take charge of departments, businesses, branch offices, and set things humming.

As always, there are not enough ordinary jobs to go 'round—but rarely before in the history of American business, has there been so much room at the *top!*

Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who have been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition *NOW!*

And don't let anyone tell you that "Opportunity Only Knocks Once"—that's one of the most untruthful sayings ever circulated. Opportunities flourish for *every* American every day of his life.

Far more to the point is to be ready—be *prepared*—to make yourself *interesting* to the big-time employer—and, LaSalle offers you a short-cut method of qualifying for opportunity jobs in accounting, law, traffic, executive management, and kindred occupations.

LaSalle Extension is 30 years old—over 30,000 students enroll annually—60 American firms each employ 500 or more LaSalle-trained men—surveys show that average LaSalle students attain good salary increases after graduation—nearly 10% of all C. P. A.'s in the U. S. A. are LaSalle alumni.

Why not find out what LaSalle has done and is doing for men in *your* position? Send and get the facts; see what LaSalle can do for you personally!

There's no question about it—jobs are looking for *trained men*—the time has come for you to *qualify* for future prosperity. Mail this coupon today!

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CHIPS *from the* EDITOR'S WORKBENCH

Contest Winners

The Tobacco Can Contest, announced in the March, 1940 issue of MI, was almost too successful. Each morning, as the mail man staggered in with another load of entries, the whole office staff would drop its regular work to unwrap the packages. The contestants certainly were ingenious, their entries ranging all the way from simple ash trays to elaborate table lamps.

Our congratulations . . . and checks . . . to the following winners: First prize, of $15.00, to Arthur Alford, 20 Gillespie Avenue, Greenville, Pa., for an eighteen-inch table lamp that is both decorative and useful. Second prize, of $10.00, to Albert G. Le Compte, 422 Broadway, North Attleboro, Mass., for a miniature flower pot holder. Third prizes, of $5.00 each, to: Herman R. Walling, 231 Centre Street, New York, N. Y., for a compact sewing kit; Vivian Raecher, Gowanda, N. Y., for a pair of practical book ends; and John C. Luce, 1710 Cutter St., Toledo, Ohio, for a rotary calendar and memo pad. Fourth prizes, of $2.00 each, to: Axel E. Ogren, 10640 South State, Chicago, Ill., for a steel wool holder; Virginia Schettler, 571 East Tenth Street, Winona, Wis., for a neat little nut basket; Ralph La Point, 359 Memorial Parkway, Niagara Falls, N. Y., for an ingenious ash tray;

[*Continued on page* 12]

The prize winning entries. Extreme left group: fish lures, sewing kit, rotary calendar. Center group: table lamp, flower pot holder, basket, steel wool holder, salt and pepper shaker. Right group: ash tray with cigarettes, book ends.

Picking the prize winners in the MI Tobacco Can Contest was no easy job! Here are just a few of the entries sorted out by the MI staff. Odd angle to this contest was the duplication of ideas by readers in separated parts of the country.

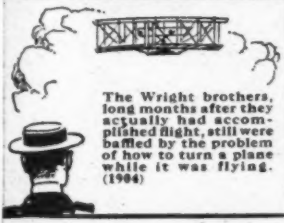
Promotion Begins at Home

If you are an average grade school graduate, the average man with High School training earns $16.30 a week MORE than you.

YESTERDAY— **TODAY—**

In 1900 . . . Many doctors then practicing were not even high school graduates. High School had not been required at the time they entered medical school.

In 1940 . . . Schools of nursing require high school graduation because most of them are conducted at *college* level. Progress has made modern nurses' training equal or superior to that available to many old time doctors.



The Wright brothers, long months after they actually had accomplished flight, still were baffled by the problem of how to turn a plane while it was flying. (1904)

Thousands of schoolboys 14-16 years of age know more today about airplane design than the Wrights knew at Kitty Hawk.

In 1900 . . . The High School Graduate was a person of distinction. Only *one* person in 800 had finished high school.

In 1940 . . . More than a MILLION boys and girls completed high school. Graduates now are commonplace. High school is *minimum* educational requirement in most lines.

In 1900 . . . Very few even thought of going to college, unless to enter one of "the learned professions." The number of college graduates in business and industry was so few that they formed practically NO COMPETITION in the average job.

In 1940 . . . Almost exactly as many are being graduated from college, today, as from high school 40 years ago. Everywhere—in everything you do—in commerce, industry, personal affairs, you are up against the competition of COLLEGE GRADUATES.

In 1900 . . . The "little red schoolhouse" did a pretty fair job of equipping men and women to make their way in the world.

To Get Ahead Today You MUST Finish High School

Alice in Wonderland learned: *"You must run as fast as you can in order to stay where you are. To get anywhere, you must run TWICE that fast."*

Your own life, today, is like that. During the day, you must try as hard as you can—as well as you can—in order to be sure of holding what you already have. To get anywhere in commerce, industry or socially—to win a better job—bigger pay—greater success in your social activities—you must make EXTRA effort in your SPARE time to meet the competition of better educated people.

Do you want

- **. . to go to College?**
- **. . or to enter a Profession?**

(*Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.*)

- **. . or get an Office Position?**

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Editor's Workbench Chips

[*Continued from page* 10]

M. B. Roberts, 34 Radley, Battle Creek, Mich., for a collection of clever fish lures; and Ted Gallazzi, 476 Jackson Street, San Francisco, Cal., for a combination salt and pepper shaker.

To the other contestants who weren't lucky enough to get in on the prize money, our thanks for their splendid cooperation.

As emphasized in the original announcement, this was a simple, friendly little contest, intended primarily to promote constructive thinking on the part of our readers. Small prizes were offered only to make the affair interesting. It is obvious from the contestants' letters that everybody had a lot of fun, which is all that counts!

As mentioned in last month's "Workbench," we are now drawing up plans for a much bigger home workshop contest, this time centering around cigar boxes. Full details will be published shortly.

* * *

Sesquicentennial Celebration

People who think of inventions in terms of ultra-modern machines such as airplanes, automobiles, etc., are a bit shocked to learn that the patent system of the United States is celebrating its 150th anniversary this year. It was no less a person than George Washington who approved the first patent law on April 10, 1790! Within fifty years of that date, American inventiveness produced the telegraph, the reaper, the vulcanization of rubber, the revolver, the sewing machine and the rotary printing press. By 1836 progress of industry was so rapid that the patent system had to undergo revision and refinement, and in the 104 years following there has been granted the staggering number of 2,196,000 patents!

"There were inventors, of course, before 1790," says Conway P. Coe, U. S. Commissioner of

[*Continued on page* 14]

Big shots get together. Left to right, above: Edward J. Noble, Under-Secretary of Commerce; Charles F. Kettering, head of General Motors research activities; and Conway P. Coe, Commissioner of Patents, shown as they attended the United States Patent Law Sesquicentennial Dinner in Washington, D. C., in April of this year.

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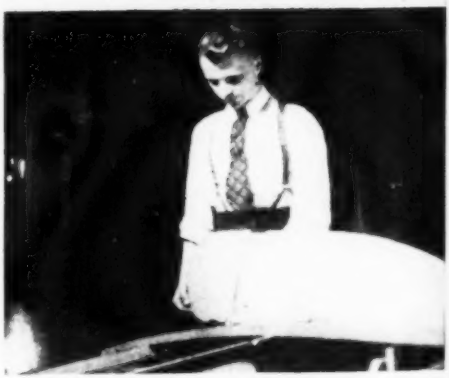
Editor's Workbench Chips

[*Continued from page 12*]

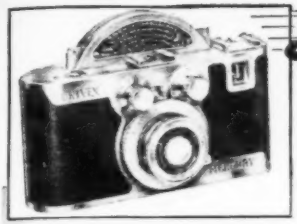
Patents, "and man's inventiveness long preceded our patent system. Down through the ages his ingenuity produced many useful contrivances. But for these there was no reward but their makers' sense of achievement. There was no material return, no protection. For instance, gunpowder has been for centuries both a beneficent and a baneful influence in the world, but the true

[*Continued on page 15*]



A standing joke among boat builders concerns the sailing enthusiast who built a boat in his cellar and then had to blast away part of the foundation to get the thing out. Well, here's a true story that's even better, and the above pictures are offered as proof. R. G. Sprecher, 14454 Kilbourne Avenue, Detroit, Mich., built the 18-foot sloop "Corky" in the ATTIC of his house, but because he did some very careful measuring first, he was able to slide it out of the attic window and down to the street without the slightest difficulty. One picture shows Mr. Sprecher at work on the keel; the other shows the finished boat (and a mightly slick job she is, too!) being eased down a pair of skids under the control of five husky men. These pictures win this month's first prize of $5.00.

"Corky" was fully described in the No. 4 Edition of HOW TO BUILD 20 BOATS, copies of which are obtainable from MI for 50 cents each. A beautiful set of professional-type blueprints for this popular boat is available for $3.00.



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Note! When writing address Dept. M-7.

Chips From The Editor's Workbench

[*Continued from page* 14]

identity of its discoverer is still hotly disputed. The American patent system has encouraged the use of good means to worthy ends. It has succeeded in profiting the whole nation by safeguarding and recompensing the individual."

Has invention gone too far in producing machines that replace human labor and cause unemployment? To this question, on the tongues of many employers and employees alike, Commissioner Coe replies:

"We are not yet blessed—or cursed—with machines that make themselves. Those now in service had to be constructed of raw materials which had to be produced and transported and fashioned to requirements. All of these processes necessitated human effort. In short, man is prior and indispensable to the machine. You can have man without a machine, but you can never have a machine without man. The moral which this anniversary impresses on me is that patents have put a premium on genius, and all of us have shared the gains."

* * *

Light on a Dark Subject

Despite all the progress made in automobile design and construction, in road building, in tourist facilities in general, the problem of safe driving

[*Continued on page* 16]

William L. Thompson, of Teeswater, Ontario, believes in full size midget cars! This husky bus, powered by a 1⅝ h.p. air cooled engine, rides on 16x4.00 tires, carries four persons, and is capable of 25 m.p.h. He has also made a smaller car, for two passengers. They are driven with ease by his ten-year-old daughter and seven-year-old son.

In sending in this picture and a few others, Mr. Thompson wrote, "I thought these cars might be worthy of mention." They are, and they are also worthy of a Workbench award of $3.00.

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Editor's Workbench Chips

[*Continued from page 15*]

Yes, look again! That is an airplane you see. Only it's a midget built by Verdy H. Sheperd, of Liberty, N. C., for his eight-year-old son. He spent four years of spare time on it, and he has real reason to be proud of it. It has a wing-spread of 14 feet, is seven feet, three inches long and is powered by a two-cylinder motorcycle engine that is more than 25 years old. The ship doesn't actually take off, but the Sheperds have a lot of fun running it around the local ball park.

Young Sheperd is probably the most envied little shaver in town, not only because of the plane, but because his father is a barber. (Ouch!) A $3.00 Workbench prize for this welcome contribution.

at night remains unlicked. If anything, the situation is getting worse, what with headlights now brighter and more efficient than ever before. Sure, all cars are equipped with beam-lowering switches, but a three-hour drive after dark on any highway will convince you that most car owners never heard of them. The really considerate drivers are the bus and truck boys, to whom the word "safety" is more than a mere slogan. They'll depress their headlights, but all their thoughtfulness is nullified by the selfish pigs who leave their lights blazing and all but make you run off the road.

Human nature can't be changed, but headlights can. Clearly, the solution is for all car manufacturers to adopt polarized glass for both headlights and windshields. Of course, several million

[*Continued on page 17*]

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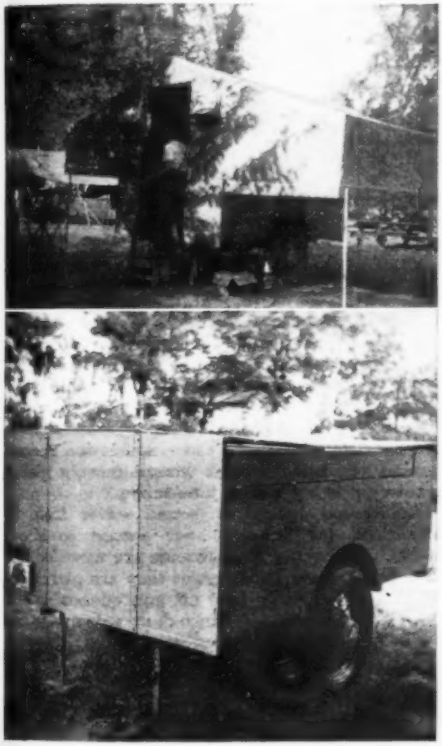
Editor's Workbench Chips

[*Continued from page* 16]

old cars will still be on the road, but demountable screens would readily eliminate them as sources of danger.

Right now polarized glass is a bit on the expensive side. However, so was safety glass a few years back, when it was furnished only on special order. Today, safety glass is pretty much standard equipment, practically all states requiring it for new cars. The headlight problem is a bit

[*Continued on page* 18]



These pictures show the folding auto trailer constructed by George F. Gifford, 62 Colony Street, Bridgeport, Conn., from plans that were published in MODERN MECHANICS about eight years ago. It cost him only about $60, including registration, and he has towed it all over the New England states. It is equipped with two full-sized spring beds, ice box, electric lights, kitchen cabinet, running water and screen windows. It requires only fifteen minutes to be set up completely.

"I have been asked dozens of times where plans for this trailer could be obtained," writes Mr. Gifford. "I lost my original copy of the magazine."

Back copies of the old MODERN MECHANICS are not available, but an identical trailer was described in the 1938 SPORTSMEN'S ANNUAL, another well-known MI publication. This was the "E-Z Tow" Trailer. The plans and specifications in SPORTSMEN'S ANNUAL are quite detailed and the construction work is fairly simple. Copies of SPORTSMEN'S ANNUAL are available at the price of 50 cents each directly from the Circulation Department, Fawcett Publications, Inc., Fawcett Building, Greenwich, Conn.

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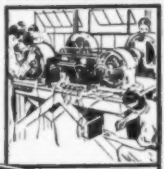

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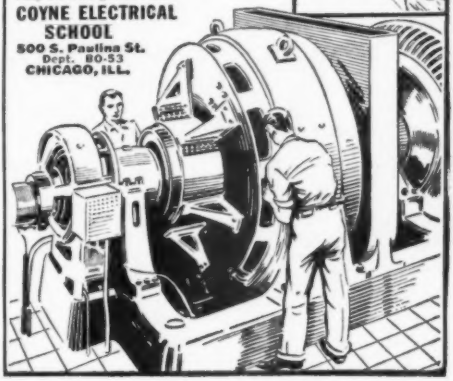

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28x5.25-18	2.95	1.25
29x5.25-19	2.95	1.25
30x5.25-20	2.95	1.25
31x5.25-21	3.25	1.40
6.50-17	3.35	1.40
28x5.50-18	3.35	1.40
29x5.50-19	3.35	1.40
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Editor's Workbench Chips

[*Continued from page 17*]

The fact that he lives in a trailer house doesn't prevent Charles Skellenger, of Eastman, Wis., from enjoying the benefits of electrical appliances. He built this compact, self-contained charging unit and keeps his storage batteries in top-notch condition all the time. The outfit consists of a gas engine taken from a washing machine, a Ford generator and an ammeter; total cost, $7.85. The engine runs three to four hours on one filling. Charlie will receive a $3.00 Workbench award for this picture.

more complicated in that ALL cars must be Polaroid-equipped in order that the benefits of the system can be enjoyed.

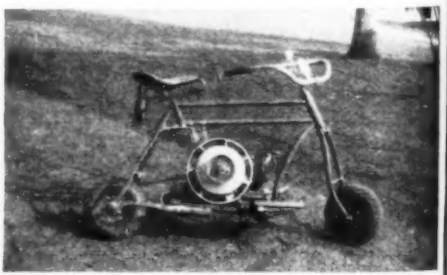
* * *

Silent Noise

A novelty now being advertised rather widely is a "silent whistle" for calling dogs. Many people think this is a joke of some kind, in the same class with left-handed monkey wrenches and meatless meat pies. Well, 'tain't. Most animals can hear sounds beyond the range of the normal human ear, and the trick whistle merely makes a noise up in the higher tone range.

Adults can distinguish sound waves from 16 vibrations (or "cycles") per second to about 16,000. Below 16 cycles, sounds are more or less thumps. Around 10,000 cycles they are piercingly shrill and gradually fade off into silence as the frequency is increased. Since dogs, cats and other

[*Continued on page 19*]



Ninety miles to a gallon of gas is what Raymond V. Texter, Jr., of Mont Clare, Pa., gets out of this motorized bicycle, which he built from plans appearing in the August 1939 issue of MI. A ¾ h.p. motor out of a washing machine pushes it along at 15 m.p.h. This is an exceptionally neat job, and earns a Workbench prize of $3.00 for its builder.

Editor's Workbench Chips

[*Continued from page* 18]

animals can't answer questions, we don't know exactly what their tone response is, but the fact that the "silent whistle" actually works is significant in itself.

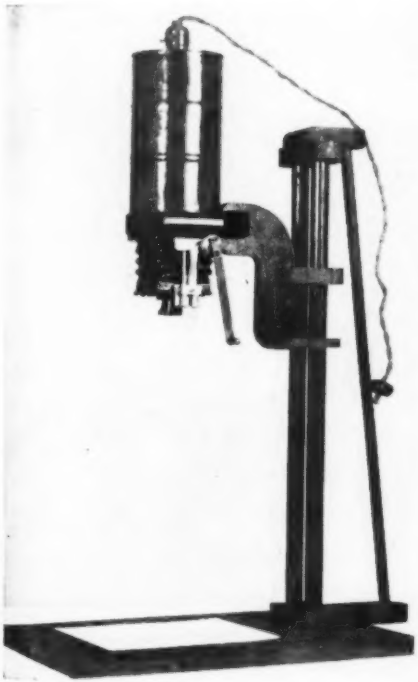
* * *

Spy Stuff

I am both amused and annoyed by the many highly incorrect references to "codes" and other forms of secret communication that appear in newspaper and magazine stories. Frequently the writers mean cipher when they say code and code when they say cipher, and sometimes they are completely mixed up. So that you can properly evaluate these stories when you read them, bear in mind the following "dope."

The general art of secret writing is known as "cryptography," and any unreadable or meaningless mesage is called a "cryptogram." There are two ways of converting a clear message into a cryptogram. If we take any word, say "machine,"

[*Continued on page* 20]



Eric Garell, 2109 Broadway, Schenectady, N. Y., says that he spent only twenty cents for this splendid little photo enlarger. He used odds and ends that he had on hand, and made the bellows from instructions in GOOD PHOTOGRAPHY No. 1. This ingenuity is being rewarded by a Workbench award of $3.00.

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Editor's Workbench Chips

[*Continued from page* 19]

Adam Nava, of Brockway, Pa., likes to study the heavens, so he built this powerful telescope and spends many pleasant hours scanning the skies on clear nights. The 'scope, itself, is seven feet long, and the tripod extends from four to eight feet. This fine photograph earns Adam a $3.00 Workbench prize.

and spell it backward, making it "enihcam," we have *enciphered* it (in the simplest manner). The letter "e" now stands for "m," and "m" for "e," and a whole message so treated becomes unreadable because the identity of the *individual* letters of the words has been changed. However, suppose we decided that every time we use the word "tree" in a message we really mean "machine," and that we select arbitrary meanings for other commonly used words. A message treated this way is said to be "encoded." You can *read* a code message because the individual words are intelligible, but unless you have a duplicate of the code list used by the encoder, you can't decode it and understand its true meaning.

Popular spy stories notwithstanding, codes are rarely used for really important military messages, for the simple and obvious reason that both sender and receiver must possess copies of the identical code book, and code books grow legs and wings too easily. Although much more difficult to handle, cipher is safer, because only the "key" is necessary. This might be a single word,

[*Continued on page* 21]

Editor's Workbench Chips

[*Continued from page 20*]

phrase or number which enables the decipherer to rearrange the apparently hopeless tangle of words in the proper order.

Code work is routine stuff, devoid of interest or excitement. Cipher work, on the other hand, is brain exercise of the most fascinating kind, and has engaged the attention of some of the most brilliant men the world has known. By the way, an extremely interesting book on the subject, which you will finish in one sitting regardless of the clock, is "The Gold Bug," that famous and now almost forgotten classic by Edgar Allan Poe. Your local library probably has a worn copy somewhere in the basement.

* * *

Book Review

"The Story of Flying," by Archibald Black, published by Whittlesey House, New York, is an unusually complete history of aviation. Mr. Black begins by carrying his readers back some twenty thousand years to the aeronautical daydreams of a Neolithic bird watcher. Very little of the book is devoted to fancy, however, a complete and detailed coverage of the subject apparently having been the aim of the author.

Unlike many aviation writers, Mr. Black has made no attempt to be amusing. He relies entirely on an accurate textbook style of fact presentation to hold the interest of the reader. As a result, he has produced what should prove to be an excellent reference volume on the development of flying. The subject is carried up to the present day and weighed in the light of current events and their effects on its progress—even including the CAA, the present European War, and many of the headline topics of the hour.

—*Robert Hertzberg, Editor.*

You'd be pretty proud too if your pop made you a model speed boat as neat as this one! It's "Yumping Yimminy," from MODEL BUILDER'S HANDBOOK, and this picture earns a $3.00 Workbench award for Harry M. Raker, 183-01 147th Avenue, Springfield, L. I.

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POWERED BIKE—Using an ordinary bicycle frame, this sturdy little bike is easy to build and assemble, and will give exceptionally satisfactory results. Any motor of from ½ to 1½ h.p. may be used. Plans show gear ratio table. *Blueprint No.* H-72 .....$1.50

BARBARA-Q—14-foot utility outboard runabout, ideal for family use, camping or fishing trips. Takes any motor from 5 to 16 h.p. *Blueprint No.* 929 .....$2.50

MIDGE—Very light, strong 7-foot pram dinghy suitable for boat tender, or may be used as sailing and rowing dinghy. *Blueprint No.* 927 .....$1.00

Popular Patents

Something new in alarms for arousing sleepers has been patented recently. The device, which operates silently, includes a clock which at a predetermined time lowers a series of downwardly extending ticklers mounted on a board. The ticklers annoy the sleeper sufficiently to make it advisable for him to leave the bed. Should the sleeper decide to roll over out of reach of the ticklers, there would be no relief since the tickler unit extends the full width of the pillow. It may even extend the full width of the bed.

* * *

Roller skating becomes safer with the introduction of skates equipped with an automatic brake. The brake, which was recently granted a patent, is fastened pivotally at the rear of the skate. It is made of solid soft rubber and is preferably triangular in shape. Normally the brake is held about three-eighths of an inch above the skating surface. However, when the skater raises the toe of the skate, the brake drops down and contacts the floor. The greater the angle to which the toe of the skate is raised, the greater is the pressure on the brake. Therefore, the skater may readily slow up speed or stop altogether, as he may desire.

* * *

In 1939, the Patent Office sold 4,041,895 patent copies at 10 cents each.

* * *

Threading a needle is no longer the eye-straining task it used to be. For a new patented needle is provided with a threading slit which extends to the eye of the needle. In threading the needle a loop of thread is dropped into a channel from which it is guided through a slit into the eye of the needle.

[*Continued on page* 23]

Popular Patents

[*Continued from page 22*]

By Alwyn Girod

"Do you have one that will operate on static electricity?"

A patent for a perpetual motion machine will not be granted. An inventor who files an application for a perpetual motion apparatus is given the opportunity of having his filing fee refunded by the Patent Office. In no other case is a filing fee refunded.

* * *

Of particular interest now that the golf season is here is a newly patented signal contrivance to indicate by audible signals certain faults of playing. The player is equipped with a signal which may be worn on the wrist of the left hand to indicate faulty arm movements, and on the forehead to signal improper head motion.

[*Continued on page 24*]

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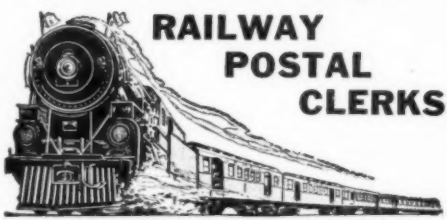

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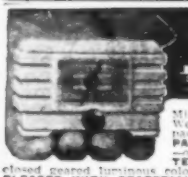

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MIDGET RADIO CO. DEPT. M-7, KEARNEY, NEBR.

Popular Patents

[*Continued from page* 23]

The signal device is adapted to register a definite instant signal at the top of a properly executed back swing of the club by a player and faults in the swing are indicated by premature slow or double signals. The signal reveals such common faults as bending the left arm on the backswing and failure to cock the wrists at the proper time. Any unsteadiness of the body or arms of the player or relaxing of the grip on the club by him at the top of the back swing, or any hesitancy after beginning the down swing causes a double signal to sound. The signal on the forehead remains silent if the head moves properly in a horizontal plane. If the head tilts in either direction, a signal is given.

* * *

Increased safety is the purpose of an auxiliary safety lighting system for automobiles. The invention consists of a light fixture mounted on the side of an automobile to illuminate the side portion of the car and the road on the same side. Such illumination is said to assist approaching cars in passing each other. The lights may be so connected as to turn on automatically when the dimmer circuit of the headlights is switched on. The side light may be mounted on the engine hood, the fenders, or on the top side of the car.

[*Continued on page* 25]

By Hal Sherman

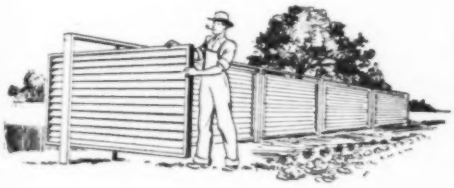
"He's been reading that MECHANIX ILLUSTRATED again!"

Popular Patents

[*Continued from page 24*]

Sixty-six thousand one hundred and sixty-six applications for patents were filed in 1939; while 41,908 patents were granted. About 44,000 applications are now pending in the Patent Office for consideration.

* * *



Orchards and fields may be protected from the destructive effects of high winds if a newly patented windbreak is used. This new wind control consists of a series of main frames mounted to revolve each upon a vertical supporting upright. Each frame has a number of horizontally mounted slats mounted at a 45 degree angle. The slats are similar to those used in Venetian blinds. The slats are so positioned that the upper edge of one slat is substantially on the same level as the lower edge of the next slat, thus providing a substantially closed wall when looking at the frames from a horizontal direction. However, the slats permit the deflection of wind upwardly when it passes through in one direction and downwardly when the wind passes through the slats in the opposite direction. By revolving the frame to present one side or the other to the wind any desired wind direction may be obtained. For protecting gardens against hot winds the winds are deflected upwardly to pass over the gardens; while frost is avoided by directing the wind downwardly into and among the growth to be protected.

* * *

Horseshoes bring luck and they brought a patent recently for a novel picture support. According to the inventor, a suitable framed picture of a size adapted to fit within a horseshoe shaped support is mounted pivotally on the inner sides of the shoe by means of arms extending from the sides of the picture frame. The frame, when in a closed or folded position, is adapted to lie entirely within the opening of the horseshoe. The outward ends of the horseshoe extend beyond the bottom edge of the frame. Accordingly, when the frame is swung to assume a vertical position, its lower edge rests on the table, while the open ends of the horseshoe are tilted forward to rest in front of the picture.

[*Continued on page 26*]

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Popular Patents

[*Continued from page 25*]

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* * *

All correspondence with the Patent Office must be addressed to the Commissioner of Patents.

* * *

Other recent patents include a periscope to enable a driver to see rearwardly . . . A match which lights even when it is wet . . . Soil proof tennis balls . . . and an electric vibrating curling iron.

—*By Morton Leese*

Patents Identified

Alarm	No. 2,190,533
Skate	No. 2,191,018
Needle	No. 2,190,792
Golf Signal	No. 2,191,683
Horseshoe Frame	No. 2,191,373
Auto Light	No. 2,193,063
Windbreak	No. 2,193,062

Available at 10 cents each from Commissioner of Patents, Wash., D. C.

By George Ludway

Science is taking a mighty ugly turn, it seems to us.

The U. S. Department of Agriculture has decided that if pigs like to eat soy beans there is no reason why people shouldn't, too, and they're working away industriously to select and breed new types of the bean for human consumption.

Scientists of the American Butter Company, of Kansas City, are pleased as punch over discovering how to put the rich vitamin content of grass into palatable food for man. They hint joyfully, in their reports of the experiments, that it's but a matter of time before we'll all be nibbling away at grass, just like King Nebuchadnezzar.

Up at the University of Rochester, in New York, dogs recently were given strong cocktails to prove that cocktails help make vitamin A available to the tissues of the body. The dogs reacted beautifully.

What it all boils down to, it looks like, is that if we give the scientists enough encouragement, the world will soon see us eating grass and soy beans, probably on all fours, while our dogs sit around drinking cocktails and listening to the radio. There's just one thing wrong with this set-up, and so far the scientists have done nothing to answer it: Who would fight the wars?

Dogs have too much sense!

* * *

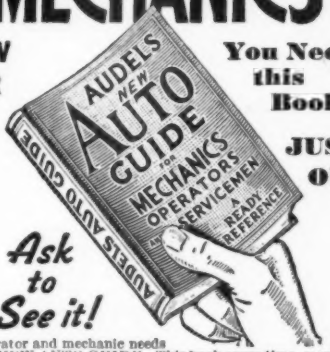
We see that a new fly spray is on the market that is made from castor oil. A derivative of castor oil is used to replace part of the pyrethum used in ordinary fly sprays, and the flies just turn up their toes and die when sprayed with it.

They ought to—we almost died just thinking about it when we were a kid!

[*Continued on page 28*]

MECHANICS

KNOW YOUR CAR



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Through The Periscope

[*Continued from page 27*]

All animals live by eating plants . . . directly or indirectly. But did you know that there are nearly 500 species of carnivores in the plant kingdom that do a neat job of turning the tables? Most of them are overlooked because of their small size, although they have world-wide distribution.

Carnivorous plants to a large extent get their nourishment from the soil and air just as ordinary plants do, but they like a little raw meat mixed in with their regular diet. Belonging to a half-dozen different plant families, their methods of trapping allow them to be divided into three general groups. One is the plant where sticky substances hold their prey fast without noticeable movement of the leaves, as the butterwort. Then there are plants with leaves constructed like a lobster trap or an old-fashioned wire rat trap and woe to the insect who gets caught! In this group are bladderworts and pitcher plants. The last group is composed of such plants as the sundew and Venus's flytrap, where the captured insect produces an irritation which sets tentacles or other moving parts in motion to hold the prey by force. You should be able to see specimens of animal-eating plants on your walks in the country this summer. Watch out for them!

* * *

"Starved for love," is more than just a phrase

[*Continued on page 29*]

"I wish you wouldn't use that expression in making forecasts—it actually is raining cats and dogs!"

Through The Periscope

[*Continued from page 28*]

By Alwyn Girod

"That's a joke on me—that wasn't a car aerial I sold you, it was a lightning rod!"

used in love stories, according to Dr. Edward Weiss of the Temple University School of Medicine. It's the real diagnosis in the case of many patients who are thin, undernourished and lacking appetite. About two-thirds of the patients who consult a doctor are suffering from emotional starvation, Dr. Weiss estimates.

* * *

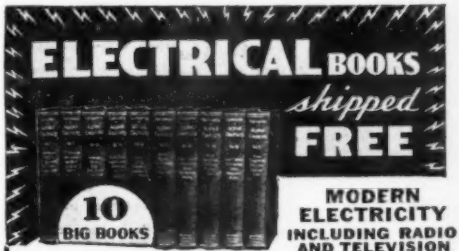
When the mosquitoes start using you for a landing field this summer, you may console yourself with this cheering thought: Man is not their favorite food! Scientists, by testing the blood source in full-fed mosquitoes, find that our little friends with the stingers prefer biting horses, cows and pigs.

Aw shucks! We used to think we were the full course, and now it seems we're just the appetizer!

* * *

Looking around for something to invent? Try this: The Royal Hospital and Home for Incurables, in London, wants a device to turn the pages of a book automatically. Many patients are so crippled that they are unable to use their arms or hands for turning book pages while reading. An automatic page-turner might also appeal to those who are just plain lazy rather than incapacitated.

[*Continued on page 30*]



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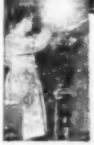

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Through The Periscope

[*Continued from page 29*]

"He's that famous daredevil flyer!"

Children in school have a fascinating new guessing game, thanks to the U. S. Forest Service wildlife scientists. It's a small glass-fronted case with a number of mounted birds in it. There are no labels to tell what they are. The children press a button corresponding to the bird's position; they press another, opposite one of the names printed in a column at the side. If they're wrong, dead silence. If they're right, a gratifying buzz. A few sets have been made up for lending to schools, and they're in great demand.

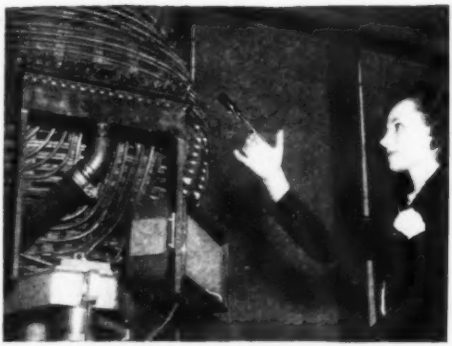
* * *

At last we have proof that we've got something on rats! When Leo Crespi, of the department of psychology at Princeton, tried to trace the human trait of gambling in rats he discovered that the little cheese-eaters would have no part of it. Even six-to-one odds failed to entice them. Twenty-one rats of both sexes were given their choice of a reward which always contained three pieces of hamburger and of another which sometimes contained six pieces, sometimes only one. Only one animal consistently chose the gambler's goal. At first it was believed that a lone consistent gambler had been found, and the psychologists were pretty happy—but no, when the gambler's goal was changed to the other side, the "gambler" continued to run to the same side.

Proving, we suppose, that the difference between a dope and a gambler is infinitesimal!

—*Cliff Taylor*

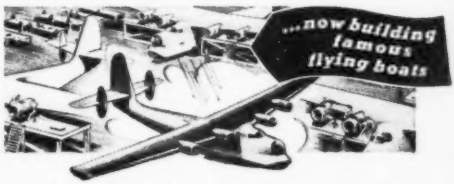
Screwdriver Defies The Laws Of Gravitation!



Supported only by the fingertip of a visitor to the Westinghouse Research Laboratories, an ordinary screwdriver is shown in a defiant pose— refusing, despite its precarious angle, to fall to the floor. Actually, the screwdriver is being held in space by magnetic lines of force radiating from the ball-shaped mass spectrometer at the right. This 800-pound electromagnet, made of 7,000 feet of copper tubing, was designed to sort molecules and their constituent atoms according to their mass. By means of an electric voltage, ions are pulled into a curved vacuum tube inside the sphere, traveling some 16,000 miles a minute when they are sorted by the magnet.

By Hal Sherman

"Just trim my corns!"



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In the great foundry of the Dodge Division of Chrysler Corporation—where nearly a million and a half pounds of metal are poured each working day—the temperatures of the molten iron are measured at a distance, with the aid of an ingenious instrument.

As the seething mass pours forth from the huge cupola, the temperature checker views it through an optical pyrometer. The action of the instrument is based on the fact that there is a definite relation between the "color" or whiteness of the molten metal and its temperature.

In training the optical pyrometer on the metal, the checker brings a small illuminated colored ball within the instrument into alignment with the image of the stream of metal.

With the ball and the metal stream in alignment, the checker turns a graduated gauge until a point is reached where the illuminated ball disappears from view. The position of the indicator then shows the temperature of the metal at the moment of pouring—usually from 2,810 to 2,840 degrees Fahrenheit.

The close control of pouring temperatures is important to maintaining uniform quality of engine blocks and other automobile castings.

The Bureau of Mines at Washington maintains the largest library of educational motion pictures in the world.

Commercial fishermen in the South Atlantic catch 10 species of shark: leopard, dusky, brown, sand, sandbar, blacktip, mackerel, hammerhead, sawfish, and nurse sharks.

Great Salt Lake is a remnant of a lake once 300 miles long and 1,000 feet deep.

More than 160 kinds of seafood are eaten in the United States.

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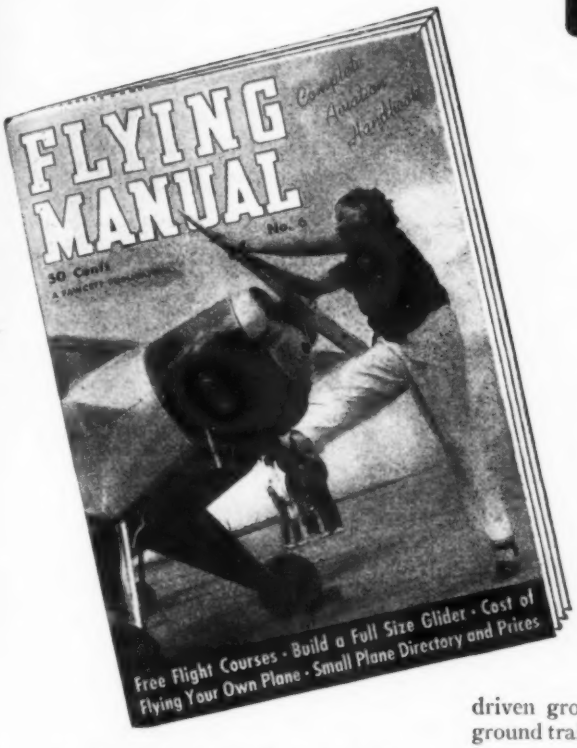
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Vol. XXIV
No. 3

MECHANIX ILLUSTRATED

JULY
1940

The Sky's The Limit!

Al Bennett points out something in the sky for the benefit of a group of young CAA students from a near-by college. There are fifty college students taking instruction on the CAA program at Al's Central Jersey Airport.

AL BENNETT is just plane crazy!

But don't get me wrong—the next time they're passing out his particular brand of craziness I'll take a double helping, and more if I can get it. Al's dream is to get everybody in the country up in the air, preferably in a "flivver plane," and he has elected himself to the one-man job of making that dream come true. If you think it's a pun to say he's off to a flying start, forget it, and cast your eyes over his activities of the past ten years.

First, he has taught approximately three thousand people to fly, ranging from the kid down the block who delivers the groceries, to the 65-year-old president of the bank on the corner. If you've always been perfectly contented with life on terra firma, if you've sworn that nobody is ever going to get *you* up in a plane, then you'd better cross the street and light off down the nearest alley when you see Al Bennett approaching. Because, if you don't, the odds are 10-to-1 that you'll not only be up in a light plane within twenty-four hours, but that you'll own all or part of it within forty-eight!

The only thing wrong with this country, according to Al Bennett, is that not enough people know how to fly. Here's the story of Mr. Bennett's one-man campaign to get all of us up in the air!

by Cliff Taylor

Staff photos by Stanley Gerstin

Eddie Lambert, flight manager of the airport and chief instructor, about to spin the prop of a Piper Club trainer.

One of the Piper Cubs, used for training planes at Al's airport, flies low over the New Jersey farms.

Al talks over some of the finer points of flying with an interested group of CAA students for an audience.

That's Al Bennett, and don't say we didn't warn you!

In the past two years Al has sold more non-military airplanes than anyone else in the world, and 1940 is already shaping itself up as a banner year in the Bennett books. But do you think he's satisfied? Not a bit of it! "There are approximately one hundred and thirty million people in the United States," he begins, with a weird sort of gleam in his eyes, but he doesn't have to continue because, by this time, it's all quite clear to you. You can see children flying to school in kiddie

One of the instructors at the airport helps the students plot their flight courses for their afternoon's solo flights.

Right: The Central Jersey Airport, as seen from the air. There are thirty-four planes based at Bennett's field.

planes, you can see housewives on their way to market in aerial runabouts, you can see the skies black with at least a hundred million droning planes. . . .

Before we take a closer look at Al Bennett today, suppose we go back to the take-off and find out just how this light-plane Lancelot got started in the business of making the world "flivver plane" conscious.

When Al was born thirty-four years ago in the pleasant little town of Hightstown, New Jersey, he found just one thing wrong with the world: Not enough people knew how to fly. If you ask him when the plane bug bit him, he'll grin and shake his head. "My memory is pretty good," he'll tell you, "but that's asking too much. I think I was fooling around with model gliders before I was able to talk. The biggest day in my life was when I was about twelve years old and went up with a barnstormer who hit town one Sunday. That settled it! From then on my life was plane and simple, mostly plane!"

To be a little more factual, Al went to the University of Pennsylvania, where his graduation thesis at the Wharton School of Finance was titled: "The Sale of Private Airplanes." After getting his sheepskin, he spent six

One of the Cub trainers takes off. Light planes of this type do not need a large airport for landing or taking off—just a flat piece of ground with some kind of a marker to indicate the wind direction.

Above: A Cub in a steep bank. Left: Al's dog, "Snapper" tugs the chock away from a plane wheel. "Snap," as he is better known, is the airport mascot and, as the picture shows, does his bit to help.

unhappy months in the aviation insurance business in New York City, and then quit to go off and earn his wings at Brooks Field, the U. S. Army Training School, in Texas.

It was while at Brooks that the cost of learning to fly impressed itself on him. He discovered that it cost the Government about $50,000 to teach a young man to fly. (Since then it has dropped to approximately $15,000.) The point was that then, as now, such a price was prohibitive to a private flyer, and everybody who wanted to fly couldn't get appointments to the Army school. Al began to ponder over the possibility of teaching youngsters to fly at a minimum of expense.

He returned to his native Hightstown from Texas flat broke, but there was an idea in the back of his head. He was going to start a flying school! He started off by talking six of his friends into putting up enough money to buy a second-hand Great Lakes biplane. The proposition was that he'd get a training plane, they would learn to fly, and everybody would be happy. After teaching this pioneer half-dozen the fine art of flapping their wings, Al started in on the helpless and unsuspecting residents of Hightstown and near-by communities.

He'd coax people into going up "just once" and that was their downfall. Once he got them up in the air, he'd convince them that life was a dull and dreary proposition without a flying license to hang over the mantelpiece. It worked. In a short time there was another second-hand plane gracing the field, and residents of Hightstown were seriously considering changing the name of Main Street to

Above: Al hands the title papers of a new plane to Dr. J. Meredith Smith, who is the president of the Sussex County Flying Club at Hackettstown, New Jersey. This was Al's 100th sale for 1939.

Right: Al, in the front seat of a training plane, turns to give a student some advice. Dubbed "flivver planes," these light little ships are rugged, dependable, and easy to handle.

Fuselage Avenue. Al Bennett was on his way!

He formed a corporation, started the Central Jersey Airport a few miles south of Hightstown, and went out and sold enough stock in it to pay for a steel hangar. That was in 1932. That year and the following one, Al and his corporation kept about one jump ahead of the sheriff, but in 1934 things began to pick up. He was not only teaching people to fly, but he was selling them a light plane at the end of the course!

His technique was simple. On weekdays he'd start off early in a "flivver plane" and head out over the horizon toward the small town areas of New Jersey and Pennsylvania. When he came to a likely looking little town, he'd land. If the town didn't have an airport it didn't bother him in the least—he'd just circle around until he found what looked like a flat patch of ground, and set his ship down.

From the time he landed until it got too dark to see, he'd take up everybody that wanted to go up—men, women and children; the butcher, the baker and the mayor. If the town didn't have an airport, Al would make it his business to corral some members of the local Chamber of Commerce and convince them that a community without an airport was a disgrace to the country, the state and the nation. And he'd show them that small planes didn't need big airports—just a flat piece of ground with some sort of a marker to indicate the wind direction.

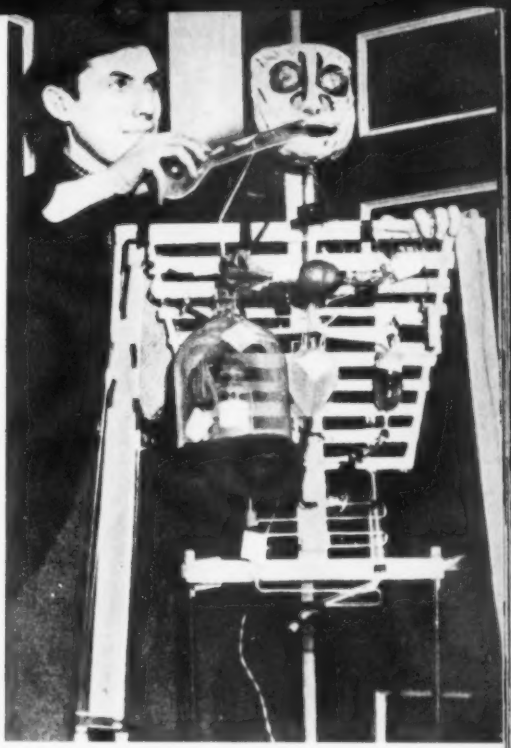
"Need for landing fields is the main obstacle to general acceptance of light planes as a medium for private transportation," he says. "Once you show the average person how simple it is to fly a small plane and give him a decent place to take off and land, he's going to want a plane of his own. And when he gets one, his friends are going to want one, too!" The way Al says this is enough to convince you that if every town, village and hamlet in the nation doesn't have an airport within the next ten years it won't be the fault of Mrs. Bennett's air-minded little boy, Alfred.

In the meantime, the field at Hightstown has grown into a thing of beauty and thriving activity. At present, there are fifteen training planes and nineteen private planes based there, all of the latter group being owned by Al's former students. There are five full-time instructors besides Al, and 350 students are learning their ups and downs at the moment, among them a number who are

[*Continued on page* 124]

"Star Of Alaska" Glistens

THE "Star of Alaska," one of the famous square-rigger "Star" series that once plied in and out of San Francisco in the Alaska packing trade, has been refitted and set up as a museum at a San Francisco dock. Her rigging strung with electric bulbs, the "Star of Alaska" really lives up to her name.



A Rival For "Elektro"

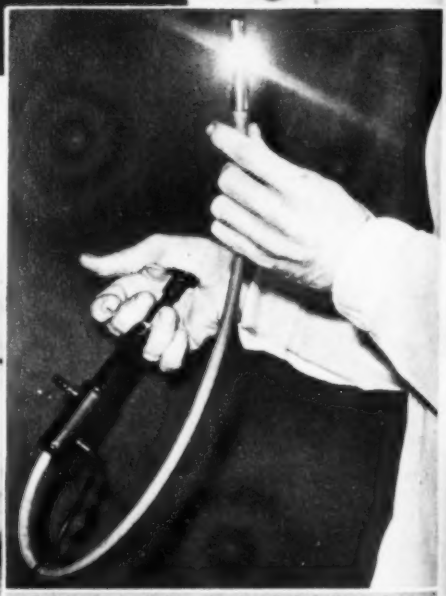
"ELEKTRO," the famous robot at the New York World's Fair of 1939, won't have it all his own way in the 1940 edition of the great exposition. This year he has a rival, "The Chemical Man," shown above, who eats, breathes, digests food and responds to pain. He's shown with his builder, Hays Gordon.

Neath The Shade Of The Old Pump Tree!

ONE of nature's most recent oddities is this rubber tree, owned by a Miami, Florida, nurseryman, which pumps water like an artesian well at the rate of 50 gallons a day. University of Miami geologists who have studied the tree report its roots must be tapping a subterranean stream. The water forces its way up and drips out of a tree crotch which it split under pressure.

Striking Shots In A Stomach Studio

The camera, attached to one end of a flexible tube, is passed down the patient's throat into the stomach. Then the stomach is inflated with air by the rubber air pump. Below: The completed camera is loaded for "shooting." There are 16 pinholes each .004 of an inch in diameter, 8 being located at each end of the camera.



Despite its small size, the tiny flash bulb produces a blue-white light of about 50,000 candlepower for 1/200th of a second. It is automatically controlled and synchronized with the camera shutter. The photograph above shows the flash at the instant of contact. Tests of the tiny camera show that it gives a complete view of the stomach's interior.

THE X ray or Roentgen ray up to the present, has been the nearest possible approach to an actual photograph of the body. It has been limited to producing a shadow showing the internal organs of the section of the body in terms of silhouette.

The gastro-photor or stomach camera therefore accomplishes the heretofore impossible. It is, as its name implies, a camera used for obtaining actual photographs of the interior of the human body.

This unique camera is the result of many years of extensive research and experiment of Dr. F. G. Back, of New York.

Turning Coal Into Flowers

RAISING gardens of "flowers" from coal is the unusual hobby of Pat Mallor of Elmont, Long Island. While working as foreman on a construction project some years ago, he noticed that fungus grew on coal beds, apparently stimulated by chemicals in the earth.

Working further along this idea, he experimented, at home, by placing coal in a

[*Continued on page* 142]

"City Of Light" Gets Brightened Up

THE pictures below show artists applying the finishing touches to different parts of the "City of Light," as the great diorama is prepared for the New York World's Fair 1940 exhibition by the Consolidated Edison Company of New York. Thousands of new architectural details have been added to the block-long, 4,000-building architectural model of the New York metropolitan area. The exhibit drew 7,500,000 visitors last summer.

NEW PLANES

FOR AMERICA!

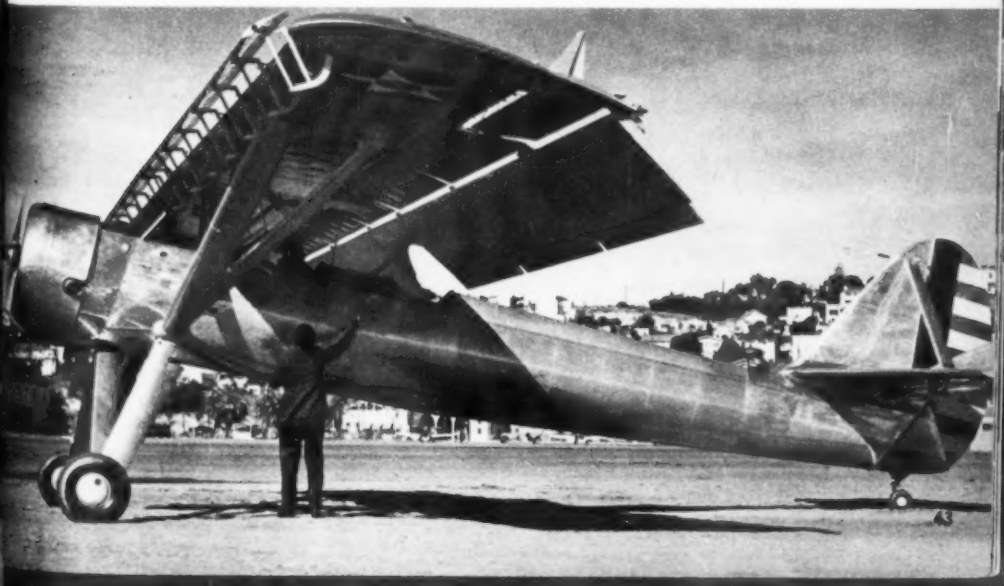
Above and below are photographs of the United States Army's new interceptor fighter developed by Curtiss-Wright. Believed to be the fastest climbing airplane in the world, this ship gains altitude at the rate of 5,000 feet per minute and attains a speed of around 300 m. p. h. An engine of 1,000 h. p. drives the plane.

THE relentless battle by American engineers for speed, safety, and performance, has produced these wonders of the air. U. S. Army planes can take off and climb a mile into the heavens—in one minute! In about twenty seconds they can roar two miles across the sky. The plane shown on the cover of this magazine and also reproduced on this page is recognized as the finest machine of its type that has yet been devised. The speed and strength requirements of aircraft like this provide a powerful incentive to designers and their co-workers in other fields of science. From these specialized aerial warriors come the structural examples that make our private and commercial ships better.

At the left is an Army bomber with enough power to fly about a dozen ordinary planes. Built entirely of metal, and heavily armed, it is a deadly warrior. Official photo, U. S. Army Air Corps.

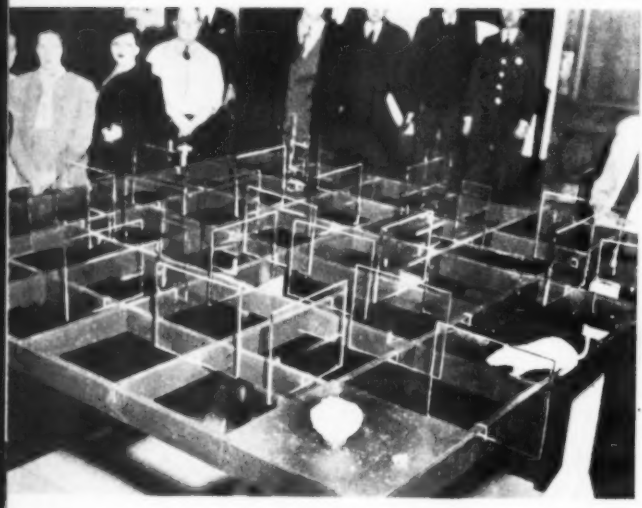
On the west coast Lockheed fights for speed. Below center, a twin engined pursuit plane, reputed to be capable of a top speed of nearly 500 m. p. h. Motors turn opposite directions.

Below: The Dragonfly, the newest type "behind the lines" ship. The tremendous wing plus a 420 h. p. engine enable this ship to climb and land like an autogiro with practically no take-off or landing run.



New Torpedo Boat "Loafs" At 46 M.P.H.

THE PT-6, the nation's newest type of torpedo boat for offshore defense, is shown here doing 46 miles an hour in its first speed test, on Lake Pontchartrain, near New Orleans. Said to have a top speed of 60 miles an hour, the craft carries a crew of ten and is armed with torpedo tubes, depth charges and machine guns. The boat is 81 feet long and cost $218,000. If the Navy accepts this boat, seven others will be built.



It's A Dirty Trick To Play On A Rat!

VISITORS to the American Museum of Natural History, in New York, are offered a first class opportunity to study the learning ability of rats as compared with that of humans with this recently installed exhibit. The exhibit includes a maze of pathways with plate glass barriers which the rats have to avoid to get the food at the other end of the passage. This white rat is cautiously coming down the homestretch, taking no chances on busting his nose on a pane of glass, food or no food!

Just So It Folds At The Right Time!

THIS furniture, made entirely of cardboard, is strong enough to support the girl and typewriter and can be folded up and carried very easily. On the chair at the right may be seen an all-cardboard carrying case which may be folded flat when not in use. Such furniture is said to be ideal for temporary offices, saving the purchase of heavy, regular office furniture.

Metal Bat Won't Break!

MADE from aluminum alloy tubing hardened by a patented process, this softball bat is the latest innovation for the rapidly growing sport. Weighing the conventional 32 to 33 ounces, the bat will not sting the hands, and it won't break or splinter no matter how hard the swing.

Wind Tunnel Wins A Trip

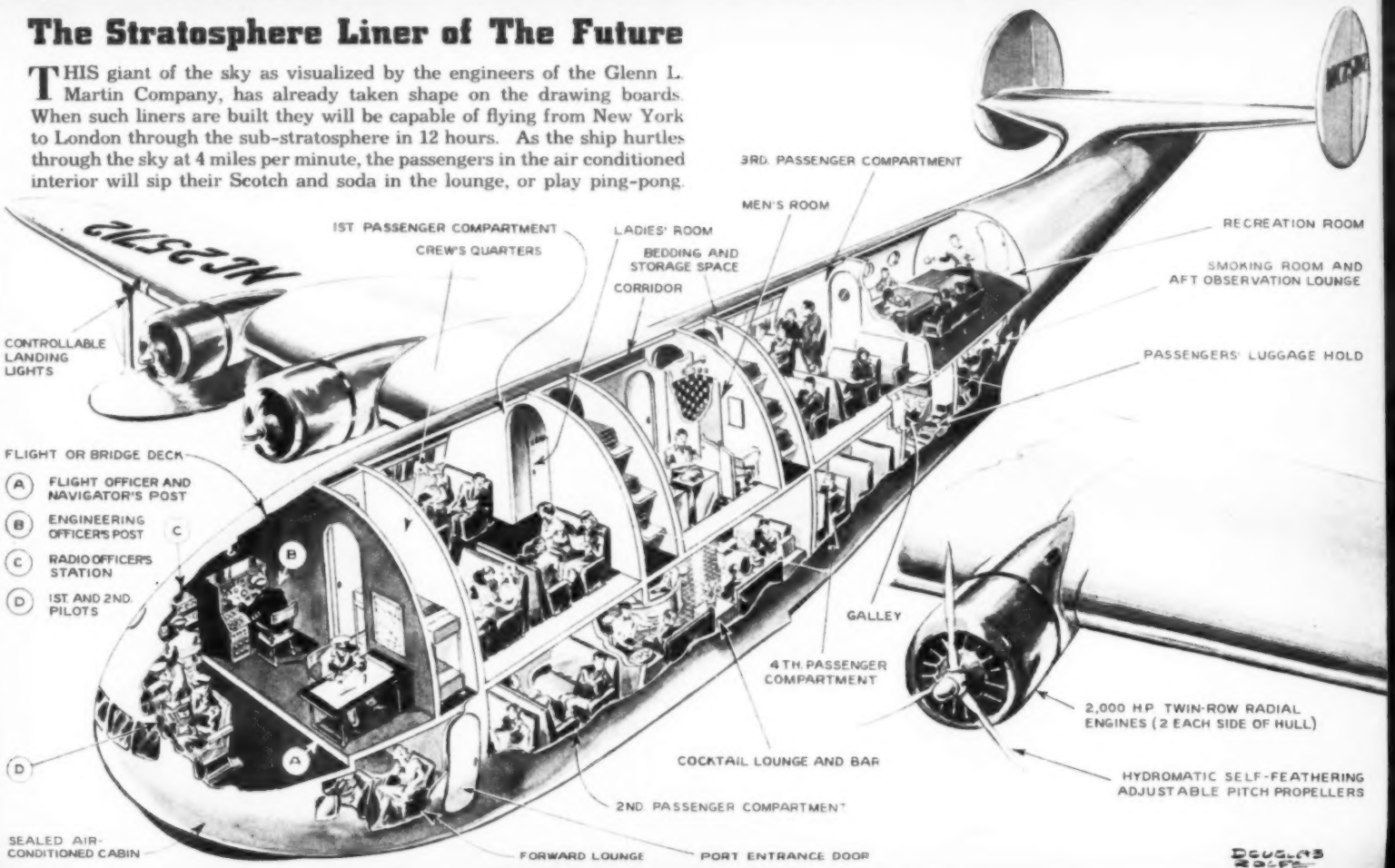
RICHARD WALTON, 17, of Pittsburgh, won a trip to the New York World's Fair with this model of a wind tunnel that measures the effects of air currents on airplane wings. Chosen the best of 132 entries, the model will be exhibited at the World's Fair.

Hen Goes In For Peanut Production

NO, THAT isn't a peanut next to the egg—it's another egg! No one has any explanation of why the hen owned by Mrs. W. T. Williams, of San Diego, California, laid this odd-looking egg, and Mrs. Williams insists she did not feed her hen peanuts. Maybe the hen just felt she was in a rut.

The Stratosphere Liner of The Future

THIS giant of the sky as visualized by the engineers of the Glenn L. Martin Company, has already taken shape on the drawing boards. When such liners are built they will be capable of flying from New York to London through the sub-stratosphere in 12 hours. As the ship hurtles through the sky at 4 miles per minute, the passengers in the air conditioned interior will sip their Scotch and soda in the lounge, or play ping-pong.



Football's Silent Man

COACH JIMMY CONZELMAN, of the

A Mere Sip Of A Girl

SEALED AIR-CONDITIONED CABIN

FORWARD LOUNGE

PORT ENTRANCE DOOR

DOUGLAS AIRCRAFT

Football's Silent Man

COACH JIMMY CONZELMAN, of the Chicago Cardinals, pats the massive chest of "Fightback" the new rubber tackle dummy. Rubber gentlemen of Mr. Fightback's family are expected to prove helpful in toughening players during pre-season practice. Note the large, soulful eyes.

Super System For Cereal

THE young lady in the picture is learning to eat her meals in aviation style with a dual control spoon. The object of the device is the duplication of the mother's hand motions by the child in eating. A mirror placed in front of the child enables the parent to watch the progress or check the machine's alignment if food goes astray.

A Mere Sip Of A Girl

CLAD in an over-sized plastic reproduction of the Rossi square vermouth glass, model Kay Williams appeared recently at the Mad Arts Ball. Miss Williams' escort was unable to get her into a taxi and was compelled to ship her in a truck. If the trend spreads to street clothes, pity the poor cabby.

Riding with Trouble!

by G. Ralph Kiel

Above is the field headquarters of the Goodyear tire testing crew on the Bonneville Salt Flats, in Utah. Salt brine and scorching heat give tires terrific punishment.

"WHAM!"

It was a terrific right to the jaw and the boss, having been totally unprepared, went down like a clay pigeon at a championship trap shoot. The driver who had thrown the punch stood over him with clenched fists, breathing heavily.

The boss was no fool. He propped his head on one hand and looked up at the man who had hit him. "What's eating you, Joe?" he asked.

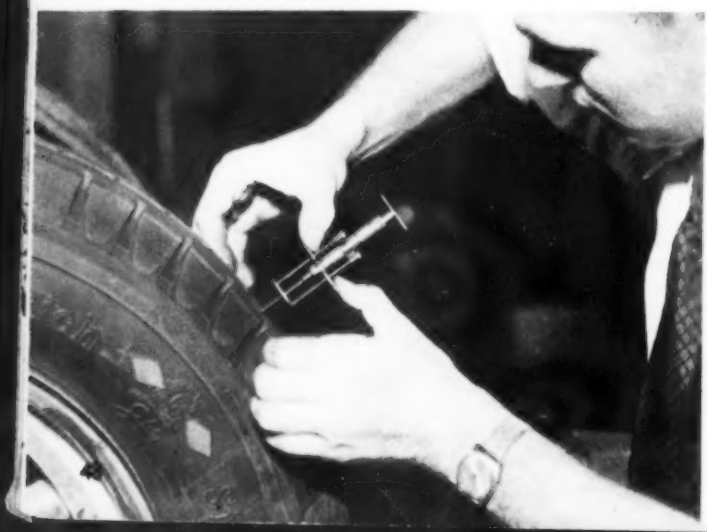
The driver looked bewildered. "I don't know," he said. He honestly didn't.

The boss nodded understandingly. "Go on home and get some sleep, Joe," he said. "You'll feel better in the morning."

Joe blinked as though in a daze, then turned and walked away. The boss got to his feet, rubbing his hand over a rapidly swelling jaw, and shook his head. "Another good driver gone," he said, ruefully. Then grimacing, he added: "But why can't I be some place else when they crack up?"

Being the boss of a tire-testing crew is no job for anybody with a weak chin; being a member of the crew is even tougher! It sounds like a soft job, well paid and interesting—but don't fool yourself. There may be tougher jobs, but for sheer, gruelling nerve strain there is practically nothing to equal the task of the lads whose job is to tear across burning sands at high speeds waiting for the tires to blow.

North of the Mexican border, in Texas, test drivers of leading tire companies are putting more miles on their cars in



A tire "Doc" takes a tire's temperature by inserting a thermocouple needle into the thread to determine the amount of heat built up after a test run. Just as a physician considers it important to take his patient's blood pressure, test drivers take their tire's air pressure throughout the day on the road.

There may be tougher jobs but for sheer, gruelling nerve strain there is nothing to touch the lads who roar across sun-baked highways and salt flats waiting for their tires to blow out!

Above: A tire-testing crew lines up for inspection along a Florida road. Long, straight roads with asphalt, concrete and gravel surfaces are chosen to reveal the life-span of the tread and the tire's carcass strength under severe heat.

Right: The resistance of tires to skidding is carefully tested on a specially-constructed "skid-trailer" which sprinkles water ahead of the tires while instruments chart their operation.

four weeks than the average motorist covers in two years. Other crews are burning up the salt flats in Utah at a hundred miles-per-hour; still others are roaring up and down the soft-shouldered, heat-baked highways of southern Florida. It's a great job for somebody with no nerves. Unfortunately, most drivers have 'em, just like the rest of us. That's why the boss got the crack on the jaw!

The majority of road tests call for running a tire until failure. That may happen within fifty or a hundred miles with a new, experimental tire, or perhaps not until after twenty or thirty thousand miles.

Somewhere in that mileage spread failure will come. But when? It may be caused by a pinched tube or a small puncture, the tire giving a dying sigh, letting down slowly as the car pulls into the curb. No harm done. Or it may come with the sudden explosion of a blowout as the car is streaking across the Bonneville flats at one hundred miles-per-hour! The drivers won't know until it happens.

Refueling and checking tires on a test car before it starts another run across the burning salt flats of Utah. Notice the salt brine starting to accumulate on the rear of the body. After a few more runs, the car will have the appearance of having gone through a severe snow storm.

This man is "barbecueing" a tire in the laboratories to study the effects the various tests have had upon the tire.

It's not bad at first, but as the miles roll up the strain sets in. Every turn of the wheel is costing money. Every mile brings failure closer.

Watch out for broken glass, rocks, and chuck holes. When night shadows creep, don't jam on the brakes! These things may cause premature failure and wipe out all test value of the run. Scientists want failure to result from normal wear.

This is when the drivers start gripping their wheels more tightly, peering ahead, waiting. This is when bosses start watching for cracking men and cracks on the jaw.

Tire companies spend thousands of dollars every year to have these drivers test tires on the road. No hospital patient has a more elaborate personal chart than a test tire. A complete record is kept from the day it is produced at the factory until the day it is returned for "barbecueing" and final examination in the laboratories.

Upon its arrival at field headquarters it is placed on a truck or car. The first shift takes the cars out at eight in the morning, drives 300 miles, and returns at four. The second shift goes out until midnight, when the final shift takes over. The cars are driven 900 miles each day.

And the mileage rolls up. One veteran driver has traveled a distance equivalent to four round trips from the earth to the moon. Another has covered 1,130,000 miles without an accident.

Both cars and trucks are weighted with sand bags. On one test a standard load may be used; another time they may be overloaded from 25 to 100 per cent to determine weak spots in construction.

This overloading practice caused considerable embarrassment to Fisk test drivers a number of years ago. Arthur D. Maxfield, chief driver, was

stopped early one morning by a state patrolman.

"Got a pretty good load, haven't you?" the patrolman said, coming over to the car.

"Not bad," Maxfield admitted.

The patrolman looked inside. "All nice and bagged up, too."

"Sure," said Maxfield.

"Well, pull it out!"

"You pull it out," Maxfield said. "And you'll put it back."

The trooper, it developed, had noticed the sagging car springs and since this was during Prohibition thought he had captured a rum runner.

Another time one of the drivers ran through shotgun fire. He refused to halt, believing it was a hold-up. Police thought he was a bootlegger. Fisk drivers say they were stopped a lot during those years.

Several times during a run the test drivers take the temperature of the day and the air pressures of the tires. But they are careful never to touch the tires. Too hot. They'd raise a burn worse than scalding water. Temperatures in truck tires climb well over 200 degrees.

They like that. The hotter the better. That's why these drivers are in places like Texas and Florida. Running tires in cold weather on northern roads would only neutralize heat build-up, and tire engineers are not interested in performance under best conditions but under the worst conditions. Heat is a tire's worst enemy.

Air pressure build-up and temperatures of the tire and the day are vital figures. From them tire engineers judge how well a tire is taking its beating, and learn how to build a cooler running tire, which retains its strength longer and wears less than a hot one.

Every day tires are removed, washed, weighed, and measured, providing an accurate check on wear. Tires are also changed from side to side and front to rear to assure a standard test.

Fisk and Goodrich crews are taking their cars over specially surveyed roads in Texas and Florida. Long, straight roads with asphalt, concrete, and gravel surfaces are chosen to reveal the life-span of the tread and the carcass strength under severe heat.

Hilly, crowned roads with plenty of curves are used to test the beads—those metal circles that run around the base of the tire and hold it on the rim. The beads are subjected to tremendous strain as the cars twist and sway on the turns.

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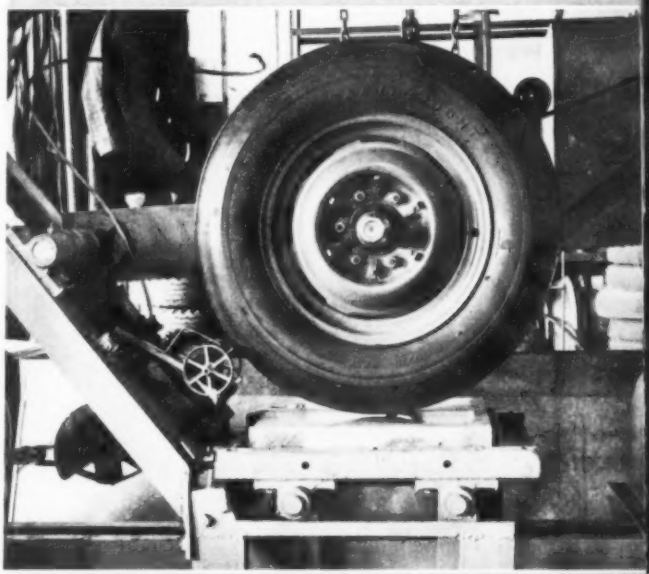


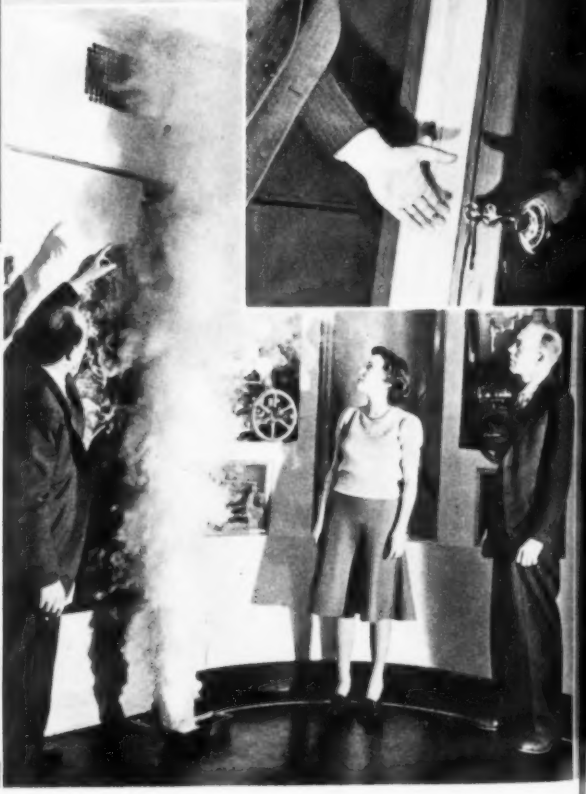
Above: In addition to outdoor road testing, tire companies have perfected elaborate machinery for laboratory tests. This is the newly perfected Fisk apparatus for checking stopping qualities of tire treads. Below: Cows, just cows, but one of the greatest menaces to tire-testing crews on the roads of Texas and Florida.

Science Is A Swell Watchdog!

Right: Operating on an adaption of a radio principle, this innocent-appearing safe door acts as one plate of a condenser, while the hand of the burglar acts as the other plate, sending in an alarm.

Below: Smoke bombs are ignited in the demonstration studio to demonstrate the working of a photronic-cell smoke detector located in the duct on the other side of the wall.

The sound-boxes or "phonetalarms" in the ceiling pick up any unusual noise and send in an alarm. Below: This electric eye has been so stepped up in power that even a swift kick past the invisible beam is sufficient to send an alarm to headquarters.



A NOVEL demonstration studio has been set up by the American District Telegraph Company, specialists in electrical protection systems, featuring working demonstrations of the latest devices, based on radio, mechanical and electrical principles to foil burglars, bandits, detect fire and smoke, and insure a night watchman making his rounds. A safe door is shown which appears quite commonplace, yet is so wired that it acts as one plate of a condenser.

A special photronic cell concealed in an air duct copes with the frequent problem of fire in air-conditioned buildings by shutting off the air-conditioning apparatus and notifying headquarters.

Mud Buggy Gets The Job Done!

BUILT by Ray Schenck, implement dealer of Clarinda, Iowa, this odd-looking vehicle is used by rural mail carrier Frank Reed to get the mail through in spite of all types and varieties of Iowa mud. It's a good bit slower than a car and its riding qualities are nothing to write home about, but, as Frank Reed says: "It gets the mail through, and that's something, if you know what Iowa mud can be!"

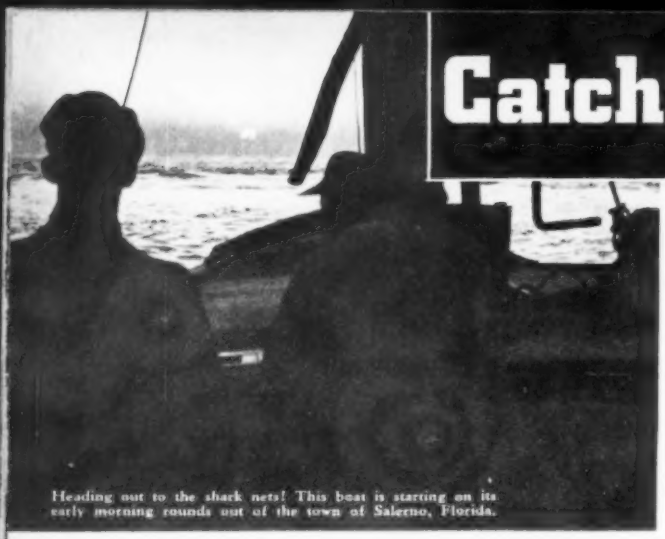
Frequency Modulation Tested

DETERMINED to give the frequency-modulation system of broadcasting a real test, with results visible to the eye as well as ear, radio engineers of the General Electric Company subjected a frequency-modulation receiver to million-volt lightning discharges, and it came through nobly. This picture shows the test taking place.

Motorists Meet The Mailbox

A MUCH needed innovation has recently been put into service by the Post Office in St. Louis. It's a letter box for motorists—instead of getting out of his car to mail a letter, the driver just drives up to one of these auto-mailboxes and deposits his mail in it as the picture shows.

Catching The



Heading out to the shark nets! This boat is starting on its early morning rounds out of the town of Salerno, Florida.

Vicious, powerful, and armed with over a hundred teeth, brother Shark commands plenty of respect from the men who go out to catch him!

by Walter E. Burton

THE blackest of reputations, and a skin so tough it can be used for sandpaper. Moves about stealthily and bites people's legs off or drags them under water until they drown. That's the sort of a fellow we were going after, the kind of a blackguard that 'Lasmo the Shark, tough guy of the briny deep, is supposed to be. No wonder we shivered in the chill of an early Florida morning as we waited for the shark boat to cast off.

The boat, a sturdy ex-rum-runner with an engine chugging away inside its tiny cabin, and a derrick sticking up where the mast used to be, makes daily trips out to the shark nets that are anchored in the ocean some 45 minutes sailing time from the dock. This shark boat keeps busy because 'Lasmo, in spite of his black past, has proved

Up comes the net with first entangled shark. Sharks become entangled in the nets and weaken themselves fighting for freedom.

Deep-Sea TOUGH GUY!

himself a first-rate commercial success.

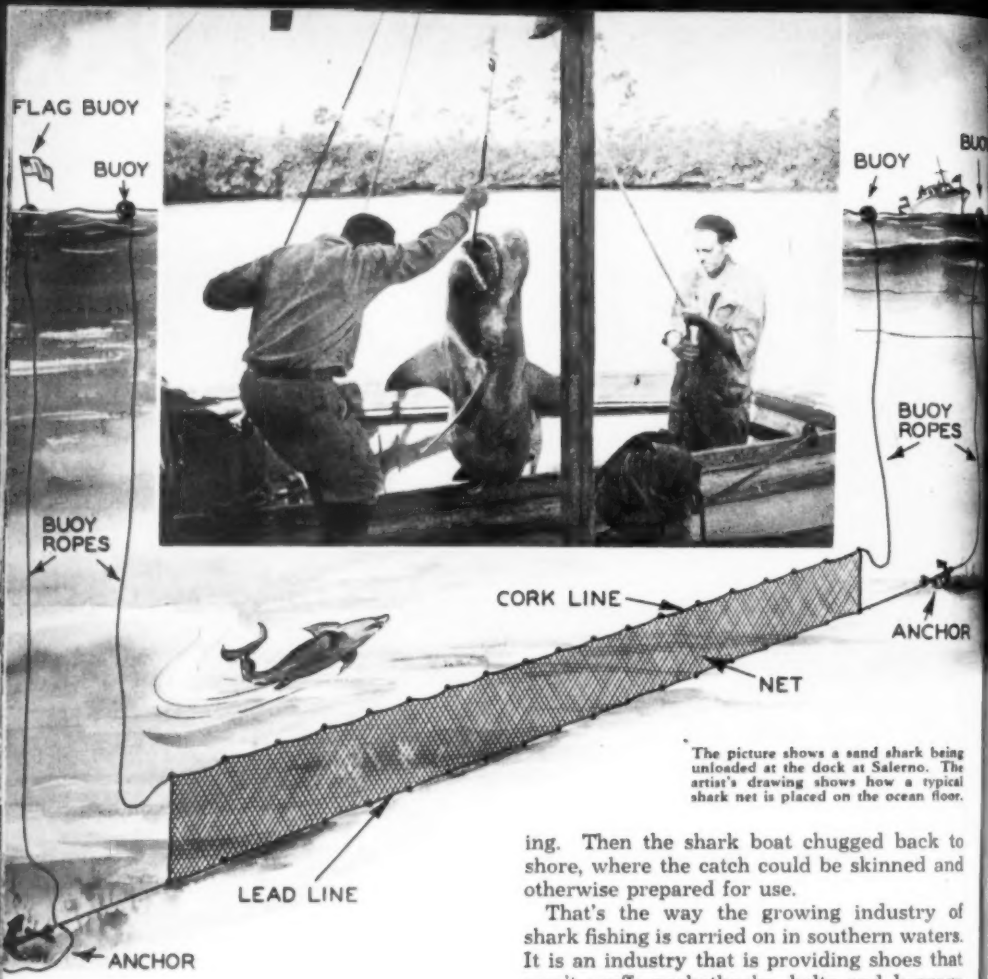
Pete, one of the two-man crew, steered straight for the flag that marked the inshore end of the 600 foot net. Soon the boat was bobbing up and down above the first shark, a huge fellow who was doing his best to tear the net to pieces. Pete reached over with a hooked pole and pulled up the cork-line that ran along the top of the net. The shark, strait-jacketed in the 10-inch square meshes of stout cotton cord, threshed to the surface.

"A sand shark," Joe, the other fisherman, drawled. "Looks like he's swallowed half the net."

The shark's razor-edged teeth had severed a dozen cords, and threatened the half-inch manila cork-line. Pete, after a few attempts, succeeded in jabbing the iron hook under its upper jaw and pulled it against the boat while Joe leaned over the gunwale and stuck the derrick-rope hook into its mouth. Then Pete hopped to the cabin roof and wound the handle of the derrick windlass. The shark, still struggling to get away, rose out of the water until its nose stuck up above the rail.

Joe picked up a heavy iron pipe a yard long.

Above: If the shark isn't dead of strangulation or exhaustion when he's pulled in, a few well-aimed blows on the skull with an iron pipe will finish him. Left: Here's Mr. Shark all tangled up in the net. The enormous power of the shark is well shown by the way he can ruin a net of stout twine and rope. Some sharks have as many as 200 teeth, arranged in rows around the jaws.



The picture shows a sand shark being unloaded at the dock at Salerno. The artist's drawing shows how a typical shark net is placed on the ocean floor.

straddled the rail, and waited until the shark swung around with the back of its head away from the boat. He brought the club around with all his strength, and smacked the shark just aft of its blunt snout. He swung again and again, until the glistening body hung motionless, a victim of brain concussion.

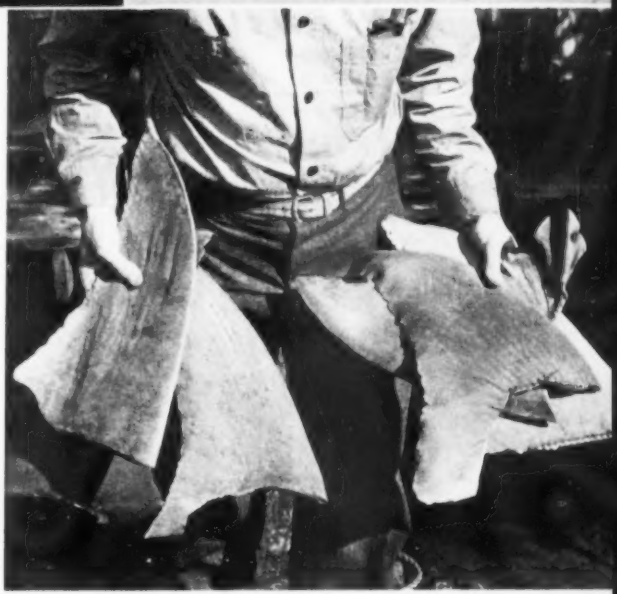
Only then was it safe to untangle the net from the tooth-studded mouth. With the derrick the two men lifted the catch out of the water and stowed it in a corner of the rear cockpit. Then, by pulling on the cork-line of the net, since the engine had been stopped, they coaxed the boat along to the next shark. They kept this up until all the nets had been relieved of their catch, which included two large sea turtles for which a buyer was waiting. Then the shark boat chugged back to shore, where the catch could be skinned and otherwise prepared for use.

That's the way the growing industry of shark fishing is carried on in southern waters. It is an industry that is providing shoes that won't scuff; pocketbooks, belts and luggage that won't wear out; oil so rich in vitamins that it is being used to improve the health of cats, dogs, chickens and humans; the raw material for a highly-prized Chinese soup; fertilizer and stock feed rich in protein and nitrogen; and trinkets and imitation jewels.

Sharks are caught usually with nets or troll lines. Standard shark nets are 600 feet long, 17 feet wide and are made of No. 72 medium cotton twine. The ½-inch manila cork lines are held up by floats every yard, and the lead lines are anchored to the bottom of the ocean by lead weights every two inches. Sharks become entangled in the nets until they cannot escape. The ones that do not die of strangulation or exhaustion are given the iron-pipe treatment when hauled to the surface. Troll lines are 300 to 600 feet long, are anchored at both ends, and provided with baited hooks on

Above: Shark liver oil is rich in vitamin A, and contains some vitamin D. Below: Dried shark fins, ready for export to Chinese markets, where they are considered a great delicacy as a base for soup.

A 250-pound turtle blundered into this shark net by mistake. He seems to be trying to get back into the deep instead of staying for soup. That's the trouble with turtles—they don't appreciate the finer things!



short side lines spaced three feet apart.

After a shark is taken to the shore station, its fins are cut off and it is skinned. The fins, unless they are from the nurse shark, are sold to the Chinese in New York, San Francisco and China for making soup. After removal, the fins are washed in sea water, and dried on a rack in the sun for two weeks. To make fin soup, the Chinese soak them in water two or three days, then cook the gelatinous rays that separate out, and serve them in chicken broth. Particularly high grades of shark-fin soup are reported to have sold for as much as five (Hongkong) dollars a cup.

The shark has been endowed by nature with a protective armor known as shagreen. This is a layer of flint-like particles or plates covering its body. Each particle is decorated with markings like those in a beautiful sea shell. Underneath these plates is a pliable layer of armor, and then the network of long silken fibers which form the part of the skin that can be turned into a durable leather. Because the shagreen particles are harder than bits of steel, sharkskin has been used like sandpaper for smoothing wood. Before shark leather could become a commercial

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He'll String Along With It

GEORGE LUZOW, of New York City, looks mighty serious as he plays a piece on his new musical invention, a one-stringed instrument with a range of tones comparing favorably to a four-stringed violin. George used a sound box from a phonograph and a megaphone to amplify the sound from the one string.

Three Reasons To Slow Down

ADDING illustrations to their words of warning, the signs which the girls are holding have been ordered erected on the streets of Avalon, at Santa Catalina Island, California, for the control of motorists. An even surer way of attracting the motorist's attention would be just to let the girls keep on holding the signs!

"Knobby" Is The Word For This!

SAFER and more comfortable driving are the benefits promised from this new type of steering wheel attachment. The complete outfit is a set of three knobs, clamped to the wheel at equal distances from each other, and set below the plane of the wheel. The device permits the driver to rest his wrists on the wheel, and gives better control of the car on sudden turns.

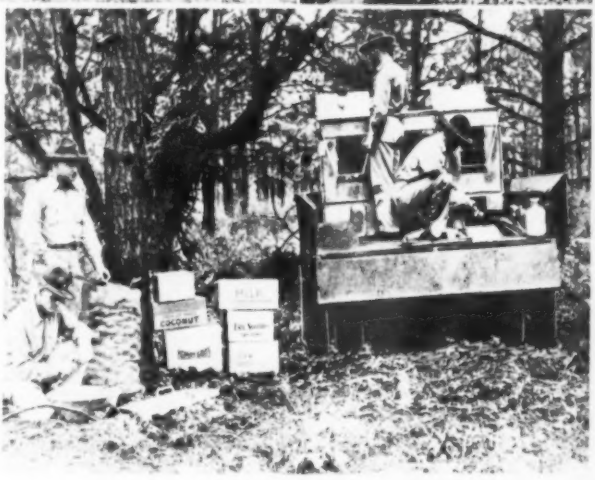
The Army Streamlines Its Rations

A private gets a pre-view and pre-taste of the army's new two-can meal, improved version of the old style reserve ration.

Below: Soluble coffee, sugar and nine biscuits in one can and meat and beans in the other mean a soldier's breakfast.

A HIGHLY specialized candy bar that is a whole emergency meal in itself. This is the U. S. Army's new answer to the problem of packing a tiny lunch for soldiers who may find themselves unexpectedly "on their own" when mess time comes.

While the army's research was intended for soldiers entirely, it may do a good turn for civilian explorers, mountain climbers, and hikers, not to mention motorists who can't discover that hoped-for tea room, and stenographers who grow weak an hour before quitting time.



Preferred feeding for the American doughboy in the field is provided by fresh and packaged food cooked on new-style army field ranges, one of which is mounted on this truck.

Developed in the Quartermaster Corps' subsistence laboratory at Chicago, the new emergency ration looks like any small chocolate bar. Actually, besides chocolate it contains vanilla, sugar, milk, and oat flour. It tastes all right. Meaning to say, the American soldier will find it an improvement over the not-too-tempting chocolate emergency ration the Quartermaster Corps handed out to our soldiers when they were fighting in France in 1918. And besides being easy to

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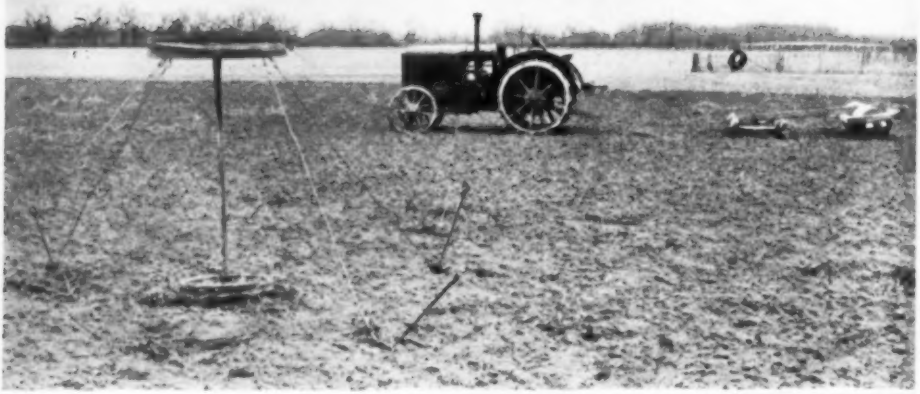
Tractable Tractor



Above: The tractor goes 'round and 'round. The winding of the tractor cable around the wheel pulls the machine toward the center in a diminishing spiral. Right: Frank Andrew, the perfector of effortless farming, shows how cable is hooked up to the tractor.

PERHAPS you'd like to be a farmer, but you think it's just a little too much trouble for what there is in it. Walking back and forth across a dusty field behind a plow or even riding a tractor while the summer sun beats down is no picnic. Not to mention the fact that it takes practically all your time.

But if you rigged up an automatic farm, the picture would be considerably different. If a neighbor dropped in some morning and asked how about a trip to town, you could say: "I'd planned to plant that south field in wheat today and my wife's making a roast. But, if you want to wait about fifteen minutes, I'll put on the planter and Martha can put on the roast and we'll be with you."

So you could go into town and not have to worry about your wheat planting. For your automatic planter would work faithfully at the job while Martha's automatic oven was taking care of the roast just as faithfully.

At any rate, Frank W. Andrew, of Palmyra, Illinois, took the drudgery out of farming when he took over the Andrew farm of 330 acres, which was homesteaded by his grandfather before the Civil War.

In the spring of 1938, Andrew's father died. That summer, Frank was graduated from the University of Illinois college of agriculture, where he had studied agricultural engineering. It was Frank's job to take over the farm of his forefathers.

Makes The Rounds!

He had a natural flair for making gadgets and tinkering with machinery. Long ago, he had conceived the idea of spiral plowing and now he had an opportunity to try it out. The spiral has been in use in various forms for a long time. Spiral binding is more or less popular for books and magazines and many bridges have been spiraled across streams.

Frank's idea was to have one continuous row that would run in a diminishing spiral from the outer edge of the field to the center. So he tried it. He fixed a barrel in the exact center of his wheat field and attached to it a cable that ran to the outer fringe. To the other end of the cable he attached the control of the tractor that his father had used.

He hitched ordinary plows, formerly pulled by horses, to the tractor and started it. The tractor moved in an ever diminishing circle around the field while the cable wound around the barrel. When the tractor had reached the center of the field, the cable was all wound on the barrel and the tractor automatically stopped. The result was one long row, about eight miles long to be exact.

His experiment was so successful that Frank decided to plant his wheat automatically. A disk, drag, roller, harrow and grain drill were fixed to the tractor. The seed bed was prepared and the wheat drilled in one operation by the machinery. When the

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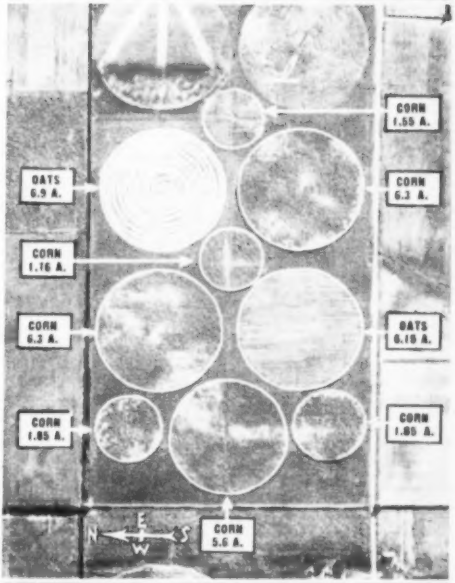


This air view shows how Frank Andrew's farm at Palmyra, Illinois, is divided into different spiral plots. This unique set-up allows for perfect crop rotation.

Above: Frank Andrew stands beside the drum that is secured by guy wires attached to stakes driven into the ground. Left: Another view of the riderless tractor.

Science, It's Wonderful!

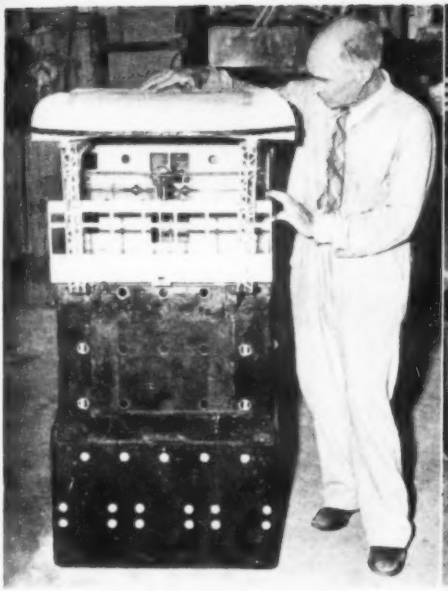
IF YOU don't think so, just ask Marjorie Maye and Emerson Welch, who are shown here testing a device which shows the reaction of the heart to excitement. Welch is holding a stethoscopic crystal microphone to Miss Maye's heart as he kisses her.

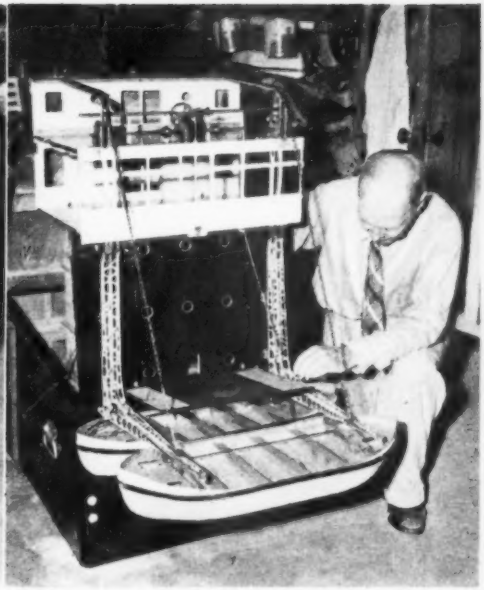
One Of These Is A Meal

THOMAS BELL, of Los Angeles, proudly holds two of the giant mushrooms that he grows in his back yard. Measuring nine and a half inches across, the monster mushrooms grow in the shade of a pepper tree, and take ten days to attain their growth.

Folding Bike Ideal For City 'Cyclists

SPORTS fans, especially city people, will like this new folding bicycle, which can be assembled or taken apart in fifteen seconds without the use of tools. One model fits both adults and children. It can be stored easily in small spaces.





The Latest Thing In Launching Lifeboats

THIS new launching device, a model of which is shown with the inventor, R. C. Wilson, of Miami, is said to make the launching of lifeboats safe under all circumstances. As shown at the left, there are two lifeboats laying bottoms up on top of a section of the deck. When launched, the boats swing out and over until they are right side up in the water.

"Doo-Jigger" Makes Diving Delightful

MADE out of an old compressed air cylinder, some valves and part of an inner tube, this "doo-jigger" enables the wearer to remain under water for 25 to 30 minutes. The creation of Captain Max W. Taylor, of the Missouri National Guard, who is shown here demonstrating it, the "doo-jigger" is refilled with air just as is an auto tire.

Routing The Radio Pirates

Photo insert: One of the radio prowl cars used by inspectors of the Federal Communications Commission in checking radio operations of various kinds. Drawing: How an inspector carrying a concealed indicating device can spot the exact location of an outlaw radio transmitter.

THE super-sleuths of pseudo-scientific fiction are mere tyros compared to the keen-eyed radio experts of the Federal Communications Commission. Ever on the alert to find unlicensed transmitting stations, they often work on the slimmest clues and bring the culprits to eventual justice. One inspector located a particularly elusive "bootleg" station, in a seemingly innocent suburban house, by observing that an electric light on a back porch blinked dimly, even during daylight. This blinking corresponded with the actual signals heard in a radio "prowl car," so the FCC men lost no time in getting into action.

Because short-wave apparatus capable of trans-oceanic communication is very compact and easily concealed in a desk or closet in a large apartment or office building, they are veritable needles in haystacks. By means of direction finders in the prowl cars, the FCC inspectors can determine the general position of a suspected station, but from then on the search is a test of their resourcefulness and patience. In cases of this kind, a sensitive meter, requiring only a few thousandths of an ampere to produce a noticeable reading, is fitted with a simple crystal rectifier which in turn is connected to a wire concealed in the inspector's trouser leg. He walks slowly through the halls of the building, pretending to read a paper that loosely covers the meter in the palm of his hand. When the indicating needle of the instrument starts to jump, he knows he is on the right track.

The 115 inspectors employed in the FCC's Field Division are primarily radio engineers, not detectives, and they get into the service through the unromantic channels of the Civil Service. Besides investigating unlicensed stations, these experts inspect all classes of radio stations, including broadcast, police, ship, amateur aviation and television; examine radio operators for various classes of

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You're RIGHT—That's WRONG!

Here are 25 statements, some of them *true*, the others *false*. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. You can take a piece of dry ice out of your favorite ice cream wagon and throw it in the coals of a roaring furnace, but it won't melt.
   True ☐ False ☐

2. When a racing airplane pilot says he's been "seeing snakes" he means that he has been doing vertical banks around the course markers which are known as "pythons."
   True ☐ False ☐

3. Any housewife can get rid of the leaks in her double boiler merely by turning it upside down, but she must make certain there are leaks in it first.
   True ☐ False ☐

4. If you have a dollar bill, it has the figure or word "one" printed on it more than two dozen times.
   True ☐ False ☐

5. In the early days it was impossible for the Sunday drivers to "step on the gas" because their old-time cars had no throttles.
   True ☐ False ☐

6. Daredevil pilots in the present fast fighting planes frequently overtake the cumbersome Howitzer shells in mid air and explode them with machine gun fire.
   True ☐ False ☐

7. When you look into the sky on a warm summer night the planets that you see are Juniper, Sauterne, and Venice.
   True ☐ False ☐

8. Back in 1862, a couple of enterprising amateur flyers set an altitude record of over seven miles.
   True ☐ False ☐

9. A planetary transmission is a short wave radio beam directed toward Mars with the idea of establishing communication with the Martians.
   True ☐ False ☐

10. Those who eat crabs and lobsters are really eating boiled inebriates.
    True ☐ False ☐

11. Dynamite is rendered so completely harmless by chilling in an icebox that housewives in mining districts actually use it as a scouring compound.
    True ☐ False ☐

12. Although the feathers and other characteristics of a peacock identify it as a true bird, it does not lay eggs.
    True ☐ False ☐

13. A monkey puzzle is an evergreen tree with large nuts growing on it.
    True ☐ False ☐

14. According to law, burglars wandering around your lawn during a fashionable afternoon cocktail party must wait until night to commit burglary.
    True ☐ False ☐

15. As a draftsman you would frequently use a chiropractor to draw angles in degrees.
    True ☐ False ☐

16. Apples, oranges, and tomatoes are fruit in general use in America at present.
    True ☐ False ☐

17. A dado head is carried as a charm by the tropical pygmies who shrink them by filling the skulls of dead dadoes with hot coals.
    True ☐ False ☐

18. A Wombat is a cute little bear-like marsupial that you might see in travelling Australia.
    True ☐ False ☐

19. Modern light weight racing cars use rotifers to drive the air into the cylinders under pressure.
    True ☐ False ☐

20. A new alloy known as "pandemonium" makes your frying pans impervious to the effects of heat.
    True ☐ False ☐

21. Seagulls never land on a beach because in certain sections of the coastal areas, vicious carnivorous clams overpower and devour them.
    True ☐ False ☐

22. When you drive your car in high gear the wheels are turning slower than the motor.
    True ☐ False ☐

23. The present world's record for airplanes in level flight over a four-mile course is over 500 miles per hour.
    True ☐ False ☐

24. An independent chuck is a ball thrown in disregard of the catcher's signals, by the pitcher in a baseball game.
    True ☐ False ☐

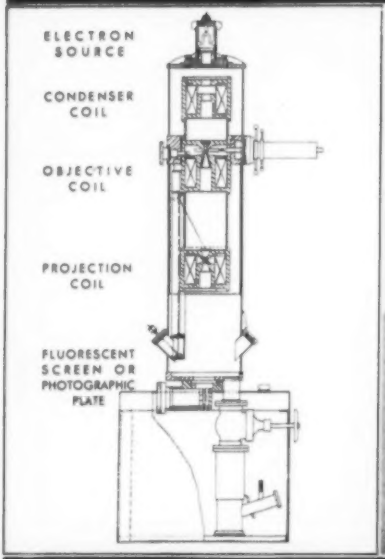
25. It would take you longer to put a flag at half-mast than to put it at full-mast.
    True ☐ False ☐

WHAT'S YOUR SCORE?

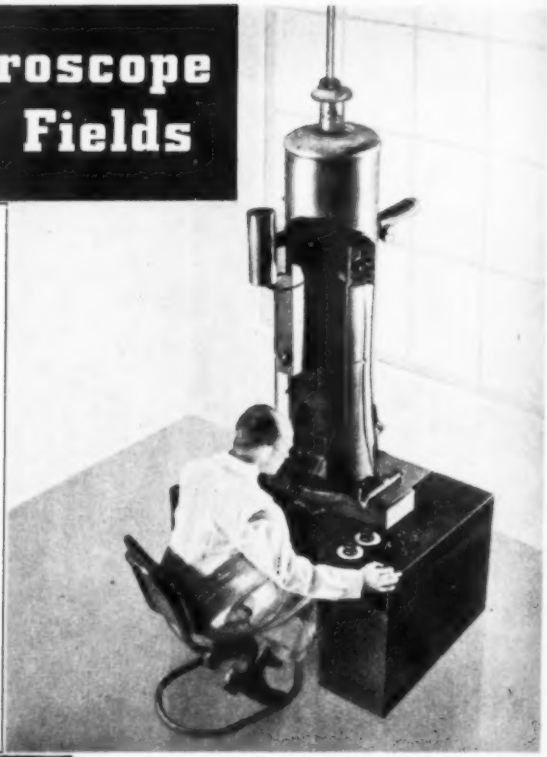
To get your score, simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 129

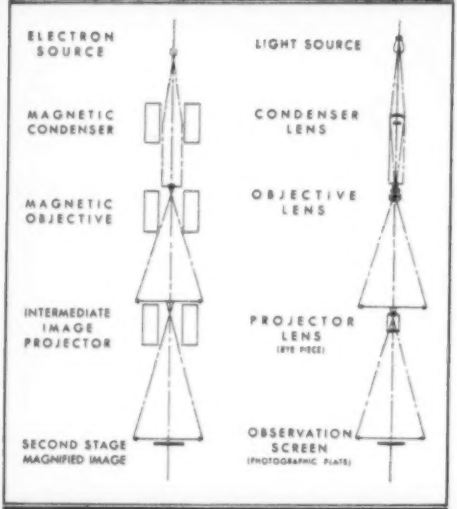
Mighty Microscope Opens New Fields



Simplified sketch of the electron microscope, which is able to magnify particles by 25,000 diameters.



Dr. Ladislaus Marton, pioneer microscopist of the RCA Radio Research Laboratories, operating the new electron microscope.



The diagram at left shows how closely the operation of the electron microscope is analogous to the conventional light microscope. (right)

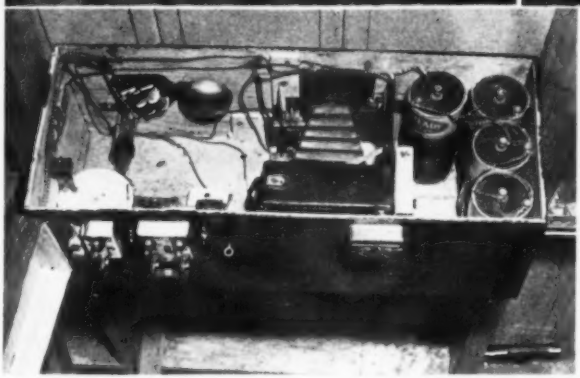
A MICROSCOPE which opens up whole new worlds that are invisible to light and shows promise of extending the boundaries of knowledge in the study of human disease and in other fields of research has been developed in the RCA Radio Research Laboratories at Camden, New Jersey.

This remarkable new instrument was designed and constructed under the supervision of Dr. Vladimir K. Zworykin of television fame, by Dr. Ladislaus Marton, pioneer microscopist, with the help of a group of coworkers that included Arthur W. Vance, M. Charles Banca and J. F. Bender.

The electron microscope, which was demonstrated at Camden to a group of famous scientists and science writers, magnifies objects by electronic means twenty to fifty times as much as is possible with the finest optical microscope in existence, and the RCA scientist look forward to even greater useful magnification in the future.

Bacteria or other minute particles to be

[*Continued on page* 131]

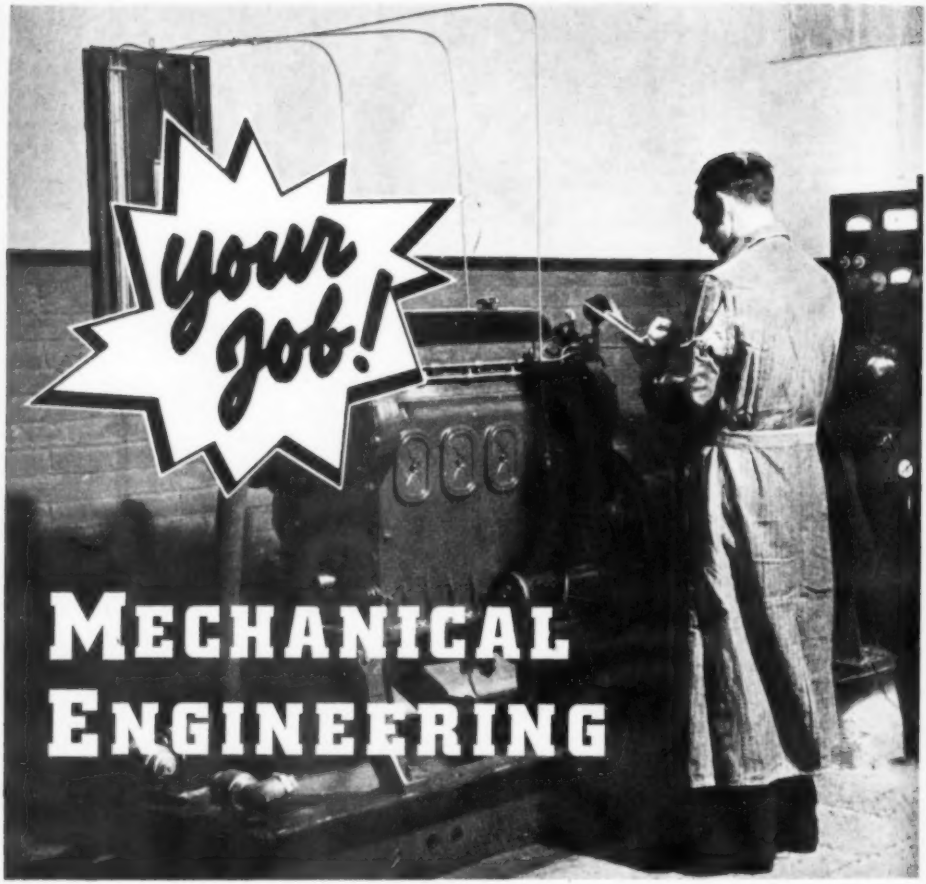


Set A Lens To Catch A Thief—"Expose" Crime

EIGHTEEN-year-old Ernest Dupuis forced a window of a theatre office, and jumped in. He landed on the hidden switch panel shown at the upper left by its inventor, Joseph Marques. In an instant the camera at the lower left went into action, and the resulting picture, above, caused young Dupuis' arrest.

Front-Drive Dog Escapes Disability

JIMMY, the dog at the right, barely managed to get home after a car ran him down. When his injuries healed, his hind legs were useless. His owner, Dr. Tokiyuki Hosokawa, wanted Jimmy to be able to enjoy life as he had before. To help him do it, the doctor made the caster apparatus shown. Now, a happier dog races around the town on two wheels. His master knew Jimmy was a good "skate."



The modern high-speed Diesel engine is only about ten years old, but its application in trains, boats, heavy trucks and in private power-generating plants has opened up an entirely new, and rapidly expanding field for engineers.

WILBUR WRIGHT stood in his bicycle shop in Dayton, Ohio, and stared at the top of a cardboard box he was holding.

He had just removed an inner tube from the box. He was on the point of throwing the box-top away when he stopped suddenly as he noticed the cardboard warp under the pressure of his fingers.

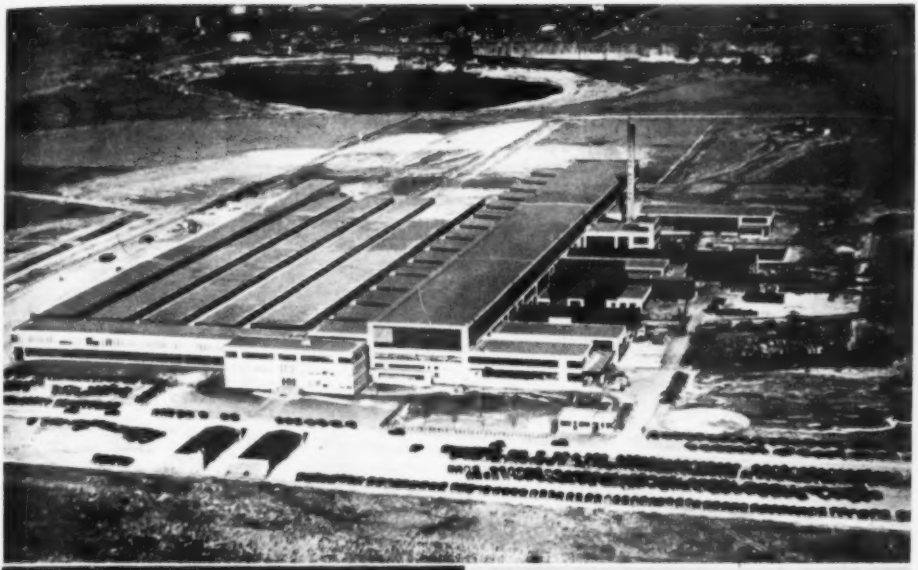
Nothing amazing about that, surely—but Wilbur and his brother Orville, right then, were confronted by a problem. They had already gone far in designing a flying machine, but the problem of lateral stability botherd them. Suppose they did get an airplane to fly, how could the wings be kept level with the horizon or banked for a turn?

That bit of cardboard was like a miniature wing. Suppose the wing of an airplane were deliberately warped, wouldn't that control stability?

It would. The successful Wright machine employed a wing-warping device whose present-day descendant is the familiar aileron.

There you have an illustration of one of the important qualities of a mechanical engineer —creative imagination. The ability to see improvements in familiar things, to see old things in new relationships, to visualize "what would happen, if—" You *can* be a mechanical engineer without strong imagination (it is not one of the two *indispensable* qualities) but you'll go through the motions more or less blindly.

Before checking up on how you'd measure



An aerial view of the Electro-Motive Corporation plant at LaGrange, Illinois, where a great number of Diesel-powered locomotives are built.

When we asked our readers to write in and tell us what vocations they would like surveyed in this series, a great number asked for information on engineering, both mechanical and electrical. Here's the first of two comprehensive articles on the subject!

by Donald G. Cooley

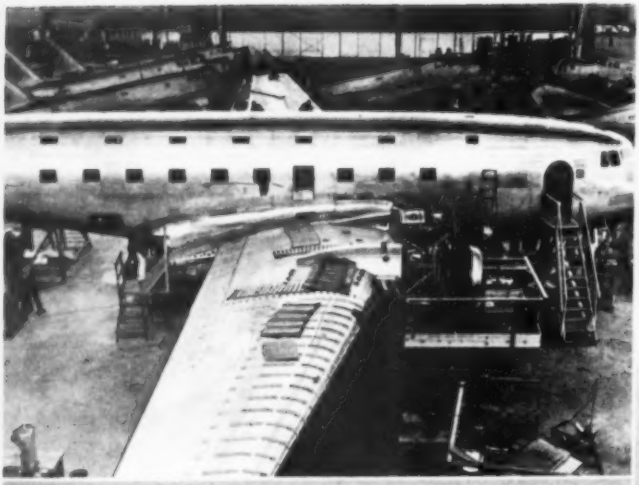
Herbert Hoover is a mining engineer who became president of the United States. As an engineer, Mr. Hoover earned as much as $150,000 a year.

up in the profession, let's see what a mechanical engineer is. Right away we run into difficulty because he can be so many things. Mechanical engineering is a blanket term which covers a hundred specialties.

Some of these fields didn't exist a few years ago. The Wright brothers themselves started one, aviation engineering; Diesel and air-conditioned and refrigeration engineering are just as young. Other fields are older—railway, marine, power plant, machine design, and scores of others.

Strangely enough, many of the most successful engineers aren't engineers at all, strictly speaking. They use their engineering training and discipline to hold down executive positions, salesmen's jobs, public relations work and administrative spots. Just about half the graduates of an engineering college, according to one survey, wind up happily in well-paid jobs which do not involve engineering directly.

Herbert Hoover is a mining engineer who became President. Lenox Lohr graduated as a mechanical engineer from Cornell, but his



Aviation is another huge field that has opened up in the past twenty years to increase the scope of a mechanical engineer's profession. At the right is a photograph of Lenox Lohr, who started as a mechanical engineer and is now president of the National Broadcasting Company.

various jobs have included topographical surveys, military engineering, cipher expert, managing director of the Chicago World's Fair, and he is now president of the National Broadcasting Company. One study shows that engineering graduates are 30 times more likely to become officers in American industry than graduates of a non-technical college.

So, if you start out to become a mechanical engineer, don't be surprised if you wind up as a captain of industry. That's not hard to take!

Such desirable positions are more or less by-products, however, because if you have the engineering type of mind you'll naturally be all steamed up about *engineering*. There'll never be any too many of your sort—though plenty of ill-qualified aspirants will fall by the wayside—for the reason that the world we live in is about 99% the product of engineers, and civilization is just naturally going to keep on calling upon engineers to improve it.

The last census of occupations showed that the country had 507,000 technical engineers. The American Society of Mechanical Engineers has 15,000 members. The main significance of these figures for you is that the profession is an expanding one as far as opportunities go, but that it's a tough baby in its requirements.

Remember that phrase out of the old World War song, "the engineers have hairy ears?" That's not only libelous but it completely misses the point, which is the quality of stuff between those ears. It's 200-proof gray matter, and if you doubt it take a look at army intelligence test records. Engineers

BALANCE SHEET

For Assaying the Mechanical Engineer's Vocation

ASSETS	LIABILITIES
Engineering is basic to our civilization: capable men will always be in demand	Demands very definite aptitudes
Profession is highly regarded by the community	Technical training absolutely essential, involving expenditure of time and money for education
Brings you in close contact with outstanding men in all branches of industry	Personality qualities must supplement engineering skill for best success
Being a "headwork" vocation, you are just approaching your peak rather than slipping at age of forty	Opportunities not evenly spread but concentrated in industrial areas
Best open road to important executive positions	Intelligence must be of very high order
	Not as much opportunity to go into business for yourself as in some other fields

Test Your Qualifications for the Vocation of MECHANICAL ENGINEER

A mechanical engineer must have the ability to analyze problems—the same ability required by the self-analysis demanded of you by these aptitude questions. Take all the time you need in answering questions, and credit yourself with 4 points for each "Yes" answer. The first two questions *must* be answered "Yes;" if not, your success in this vocation will be very difficult if not impossible. A score of 80 or better indicates satisfactory aptitude for the profession.

	Yes	No
Are you accurate to an almost painful degree?		
Do you have a pronounced aptitude for mathematics, especially in the higher branches?		
Do you advance steadily in school, ranking in the upper third of your class?		
Do you make good marks in physics, chemistry, math, preferring these physical sciences to such biological subjects as botany, medicine, genetics, etc?		
Do you like to handle details and accept routine willingly?		
Are you active in extra-curricular activities—ever manage a dance, work on committees, arrange entertainments for clubs you belong to?		
Do you take responsibility and like it?		
Is your practical judgment good so you never find yourself "out on a limb" because of hasty action?		
Do you feel perfectly at home around machinery?		
Do you like to work with objects?		
Is your creative imagination good, evidenced by ingenuity, inventiveness, ability to see how things can be improved?		
If you are given the loose parts of a simple mechanism, can you easily visualize how they fit together?		
Do you have a good vocabulary and the ability to express yourself clearly and easily in written and spoken English?		
Do you get along well with people, cooperate and work smoothly with others?		
Can you read blueprints and technical diagrams?		
Do you like to solve puzzles?		
Have you ever worked congenially with surveyors, draftsmen, construction crews, or in a job demanding mental alertness?		
Are you a frequent reader of technical magazines, textbooks, stories of engineering feats?		
Have you picked up general engineering information so that such terms as these are understandable: cofferdam, safety valve, Babbitt metal, spot welding, cantilever, turbine, jig, slide rule, core box?		
Do you tackle problems methodically and analytically?		
Have you a well-developed habit of concentration?		
Can you organize and direct others successfully?		
Have you enough self-confidence to buoy you up in a field of brilliant men where some individuals are bound to surpass you?		
Are you able to invest time and money to obtain technical training?		
Do you have a broad general cultural background with a wide and enthusiastic interest in the world you live in?		

Note: You will have a better understanding of the implications of these questions if you read the accompanying article before answering them.

ranked at the very top in intelligence, outranking physicians, accountants, public school teachers, chemists, draftsmen, and dentists who followed in approximately that order.

It's a 24-karat aristocrat among professions, all right, so let's get down to cases and assay your own aptitudes for it. First, read over the MECHANIX ILLUSTRATED aptitude test on page 71, but don't answer the questions until we discuss some of the reasons for them. It's good engineering practice to iron the bugs out of an idea by actual test, so we sprang this quiz on several young men with engineering ambitions to measure its reliability. One of these human guinea pigs—we may as well call him Bill Smith because there are hundreds of Bill Smiths just like him—raised some typical points for elaboration.

"I'm so accurate that most of my friends think I'm just naturally slow," said Bill. "And trigonometry and calculus are easy meat for me. But aren't you going a little strong when you say those first two questions in the test *have* to be answered 'yes' for engineering success?"

"Not a bit of it, Bill," was the answer. "Records show that 62% of engineering college students never graduate, and what's the Big Bertha that mows 'em down? Higher mathematics! You just can't think like an engineer unless you think mathematically. As for accuracy, that's the keystone of the whole profession. Tedious, plodding accuracy, not brilliant guesswork. Anybody who's weak in these qualities will save himself plenty of heartache by looking further for a congenial occupation."

"I can see that," Bill agreed thoughtfully. "And naturally I prefer physics and chemistry to such sciences as biology and botany—otherwise I'd want to be a bug collector or a laboratory researcher rather than an engineer. But here you ask me if I like to work with objects, when I've just taken credit for being a math shark, which means working with abstract symbols. Aren't those two qualities opposed?"

Not opposed, but blended. Engineers use mathematics, as they use mechanical drawing, as a language for turning ideas into concrete realities. In much the same way a novelist uses words to make a fictitious character a real personality. Most mechanical engi-

[*Continued on page* 132]

New Machine Takes Iron Out Of Sand

DEVELOPED by the Italian inventor, Giovanni Liguori, this machine extracts iron ore from ordinary beach sand. Shown here being tested on the beach at Ostia, Italy, the machine has a magnetic drum which picks up particles of magnetite, excess sand being washed through by a steady stream of water. Hundreds of these machines are to be built and given to families in areas where Italian sand is known to have a high iron content.

Jeepers Creepers, Pipe Those Peepers!

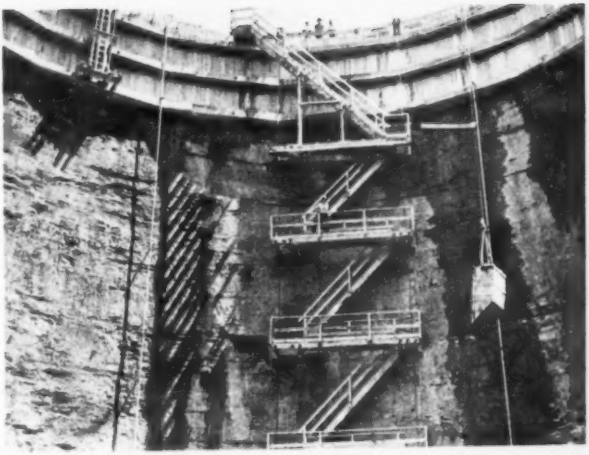
YES, that's what those funny-looking little eye-shades are called—"peepers." They shade the eyes without the use of lenses, they do not obstruct the vision, and they can be worn even when using binoculars. The young ladies in this picture are looking out over Biscayne Bay, in Miami, and seem to be quite pleased with their "peepers." The gadgets should be popular with spectators at such outdoor sports as baseball, football, tennis and the races.

Model Of A Midget Runs Four Minutes

NOT satisfied with having designed the smallest production two-cycle gasoline engine, Ray Arden, of Baldwin, New York, built a model of it. The model, at the far left, weighs only 215 grains, approximately three-eighths of an ounce. The spark plug alone took 100 hours to make, and weighs four and a half grains. The gas tank holds four drops of gasoline, enough to run the tiny engine four minutes.

World's Biggest Well Has No Oaken Bucket

THE WPA is now completing Cleveland's big well. It is 103 feet in diameter and 110 feet deep. The stairway shown leads to the bottom. It will supply up to 200,000,000 gals. of water per day, in addition to the city's regular amount. It is the intake of a waterworks plant that will cover 72 acres of land and will furnish enough water to satisfy the needs of all the thirsty people in the entire Cleveland area. No bucket seems to have been included.



You Sneeze At Two Miles Per Minute

THE high-speed camera has captured a sneeze in this photo. The sneeze involved was travelling at about 120 miles per hour. Other sneeze-shots indicate that coughs are considerably less dangerous than sneezes, as the latter are made up of a greater number of droplets. The droplets are judged to be approximately one two hundred and fiftieth of an inch in diameter. If you don't want to spread colds, speedtrap your sneezes.

There's Noah Place Like Home In Alaska

MR. AND MRS. PAUL SATKO, of Richmond, Virginia, found a new solution to the unemployment problem. Mr. Satko lost his job as a welder, so he built a boat big enough for the whole family, eight children included. Named the "Ark," the spacious vessel put out for Alaska with Satko at the helm. When the family gets to its destination a farm and homestead will be the goal. The tricycle on deck seems to be the only lifeboat.

MODEL MAKERS ARE NO MOSSBACKS!

A proud model builder holds up his creation, a twin-engined flying boat, powered by two one-fifth horse power motors. Wing span is nine feet.

Below: Something new in model airplane construction—Handley Page wing slots are attached to prevent the ship from stalling.

Above: A perfect scale model of the Douglas DC-3, powered by two tiny gasoline motors.

THERE'S one thing certain about the lads who build model planes—they aren't in a rut! The pictures on these pages, taken at recent model plane meets in Philadelphia and Creedmore, Long Island, are strong proof that model plane builders are willing to try anything once, and usually do.

It takes plenty of time and a lot of ingenuity to build a plane as elaborate as the perfect scale model of the Douglas DC-3, at the top of this page, and it takes plenty of nerve to risk the result of all that painstaking work by sending it up into the air powered by a tiny gasoline engine.

When a plane crashes, it hurts—plenty! But the model makers usually grin ruefully and rush to the wreck to see what caused it. As they lift the shattered model, they are already planning a new one.

A girl model enthusiast displays a model pusher with a tricycle landing gear. Note the rather unconventional type of wing construction and small fuselage.

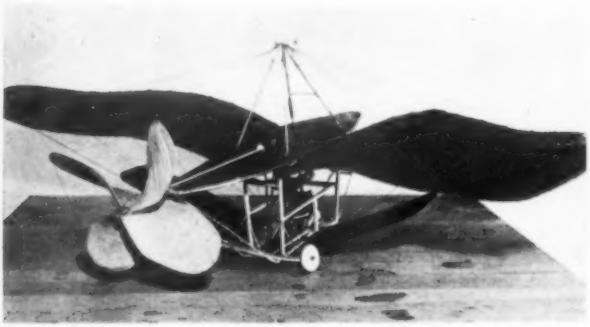
Styled after the British Mayo Composite, these model planes take off and separate in midair. A timer on the lower one cuts the motor, and the upper plane flies away.

Sprinkler Takes Care Of Itself

BY PULLING itself along a flexible cable, this new sprinkler is able to water an area 100 feet wide by 600 feet long in six hours time, without the attention of anybody. Upon reaching the end of the cable, the water turns off automatically and the machine stops.

A Little Longer, And He'd Fly!

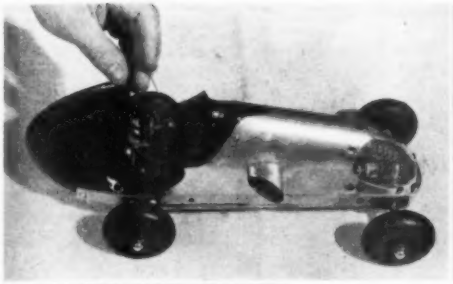
YOU'D look mournful, too, if you had to lug a pair of ears like this around all the time! The sad-looking little fellow is a French Bassett Hound, very rare in this country, with a pedigree even longer than those ears which, incidentally, measure just twenty-five inches from tip to tip. He is shown being looked over by Dr. George Ruggles, a Seattle veterinarian.



Japan Is Proud Of This Model

THE Japanese claim that Tadato Ninomiya anticipated the Wright brothers by several years in building model airplanes capable of flight, despite the fact that the internal combustion motor had not been invented. At the left is one of Ninomiya's early models.

How to Build SECTION



Home Made Power Roller. Plans are simple. This is a great work saver. Complete instructions on page 82.

Wee Willie, front-wheel drive model racing car. Powered by a model airplane engine. Page 86.

PHOTO FANS!

Beginning with this issue, a portion of MI directly following this page will be of particular interest to photo fans. The general shop projects will be found in the same general location and form as heretofore.

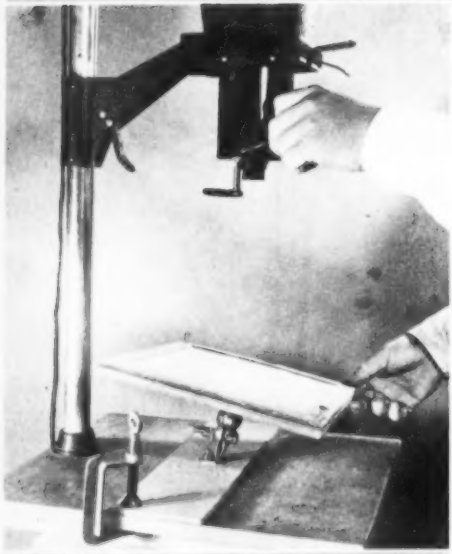
Fishing Equipment Cabinet. To keep tackle neat. See page 97.

Rustic Wagon Mail Box. Can be built from scraps. Page 93.

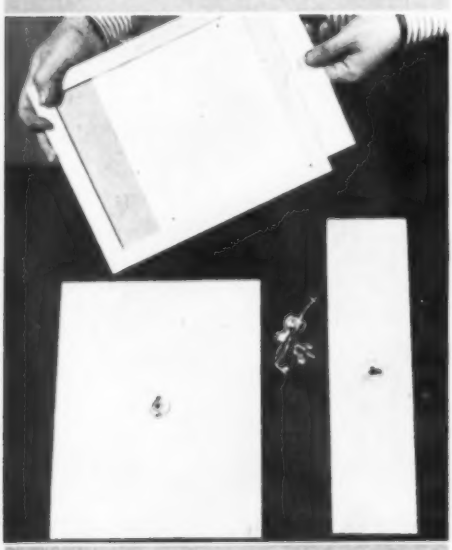
Modern Artist's Desk. The latest thing in style, on page 101.

Zinky Dink, a Metal Skiff. Built entirely from galvanized sheet metal with wood frame. Page 110.

Easel Tilting Ends



Above: Showing the completed easel in use. Note the tilt-top arrangement; also manner of assembly.



Above: Showing component parts of the tilt-top arrangement and paper holder cut from cardboard.

A NEGATIVE with a distorted image sometimes lends itself to pictorial illustration. There are other times, however, when this distortion is undesirable, but when the distortion is on the negative, you simply have to bear with it. The prospect, however, isn't really so glum. This distortion can be corrected by tilting the easel during enlarging.

You can experiment on this quite easily. Place a negative in the enlarger and tilt the paper when printing. Distortion results. Now place in the enlarger a negative whose image shows distortion caused by the angle at which the shot was made. Subsequent tilting of the easel in the opposite direction will counteract the previous distortion. The trick is simple!

The darkroom procedure for correcting distortion is the same as under standard conditions, except for several minor changes in technique. A compromise will have to be sought in focusing the image. Focus sharply, with the lens open at its widest aperture, about one third of the distance down from the highest raised part of the paper holder. Then stop the lens down until the image is sharp all over. In most cases the exposure of the paper will vary only slightly. With some negatives, where the distortion and corresponding tilt of the easel is great, the exposure will be slightly more complicated. The higher side of the easel with the enlarging paper nearer the lens will require somewhat less exposure. Shading during exposure with a card will remedy this.

It should be borne in mind, when photographing a subject where distortion will occur and where correction will be necessary, that sufficient space must be allowed at the sides, top and bottom of the negative.

Ordinarily only one angle of tilt for the easel will be found necessary to correct most distortion. Yet when both horizontal and vertical distortion must be corrected, the technique changes. The illustrated easel mounted on a tripod tilt-top was therefore devised for such extreme conditions resulting when photographing cabinets, etc. Almost any universal joint could be used instead of the particular one shown. However, the wing nut tightening feature which this one provides

Distortion

by
Andrew C. Bruening

is a great advantage. It would be rather difficult to mount a heavy adjustable easel on such a joint, therefore a light paper holder made of cardboard should be used. It should be made a standard size such as 8x10 or 11x14-in. The base of this paper holder should be of a heavier piece of card than the rest. Cut this base 2 in. longer and wider than the size of the paper it is to hold. The second piece is cut from a lighter card to match the first in outline. Then, with a sharp knife or razor blade, cut a rectangular opening in it $\frac{1}{16}$ in. wider than the sheet of paper. Take the measurements directly from a sheet of the sensitive paper. Make the cuts down the long side clear through one end of the cardboard so that you finish with a U-shaped piece.

The third piece of card must be cut to the same outside dimensions as the other two. In this third piece cut a rectangular opening in length and width equal to the actual dimensions of the projected image. This area is usually about 7½x9 in. when printing on 8x10-in. paper.

Fitting the three pieces together so that the outer edges match and cementing them firmly will form a framework into which the bromide paper can be slipped by way of the open end of the U-shaped piece. A notch cut in the top piece of the frame at the end into which the paper is slipped, will make it easier to insert and withdraw the bromide paper. Do not make the notch too deep or it will expose the end of the paper to the light.

The sheet of white paper or bromide paper which is used for focusing should be ruled into one-inch squares. This ruled sheet is a necessity in straightening both horizontal and vertical lines in a distorted image.

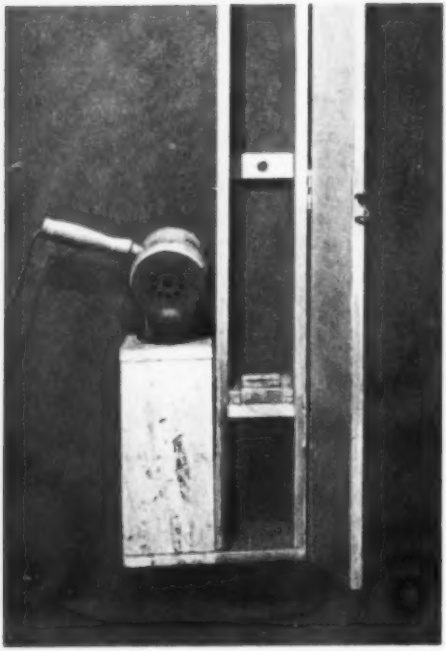
The wood easel on which the paper holder is fastened, consists of two pieces of plywood connected by the tilt-top. The bottom or base upon which the affair rests is a piece of ¼-in. 3-ply wood, and about 4 in. wide and as long as the width of the base of the enlarger. Through the center of this board a ⅝-in. long, flat head bolt, ¼ in. in diameter, was inserted from beneath. The hole drilled for it is countersunk. The top board, ¾ in.

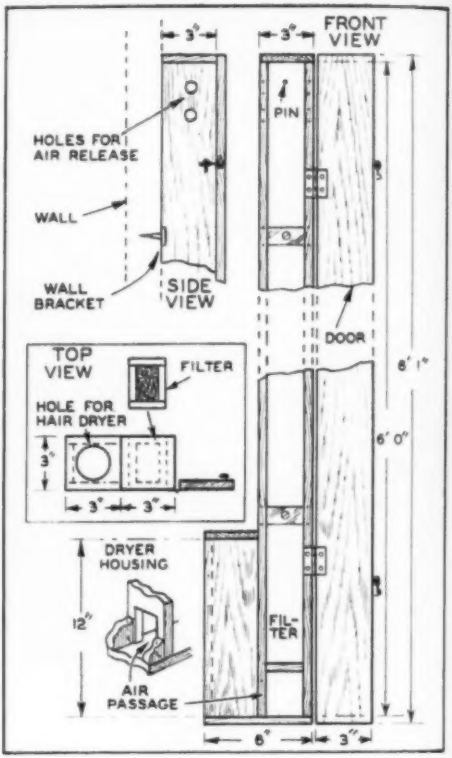
[*Continued on page 125*]

Above: This is a straight print made from the negative. Note leaning building along right edge.

Above: This is the corrected print without distortion obvious along the right side of top print.

Dustless Film-Drying Cabinet





Above: Showing the lower section of the hot-air film-drying cabinet. Note filtering element near bottom of the cabinet. Right: Complete construction plans for this simple film drier.

by A. S. Mawhinney, A.R.P.S.

A SIMPLE, inexpensive, hot-air, dustless film-drying cabinet can be constructed by anyone, with a saw, hammer and nails. It can be done and at very low cost by following these instructions. From the nearest lumber mill get the following in either white wood or pine, preferably white wood, dressed and finished to sizes given:

2 pieces 3x3x½ in. (top of drier and film housing).
3 pieces 3x½ in. by 6 feet long (walls of film housing—wall of the darkroom makes 4th side).
3 pieces 3x½ in. by 1 foot long (walls of drier housing).
1 piece 6x3x½ in. (bottom of drier and film housing).
2 pieces 2x2½x½ in. (back braces and wall bracket).
1 brass handle for door.
2 brass hooks and eyes for door.
2 small brass hinges.
2 1-in. screws and some 1½-in. nails.
One small, cheap hair drier from the drug store.

Now you come to the assembling of this material, so with many references to the accompanying drawing, let's begin:

Take one of the 6-foot sides and cut a 2-in. square out of the bottom end, for the air passage, as shown between the drier and film housing.

To this same sideboard nail the two sides of the drier housing, as indicated in the drawing, and close the housing by nailing the third side in position.

Nail on the bottom of the drier and the film housing next. Take the top piece for the drier housing and cut a round hole in it to fit the nozzle of the hair drier, nailing it down securely, after referring to the drawing for its location.

Put on the top piece of the film housing and nail on the other side of it, leaving the back open, as this back is taken care of by utilizing the wall of the room itself.

Put in the two small pieces for braces and wall-brackets in the film housing between the two sides at the back.

Hinge on the door so that it will fit

[*Continued on page 125*]

Above: Fig. 1. The sink drain is made from the rubber plunger.

IMPROVED SINK for Print Washing

by Morris Germain, A.R.P.S.

PUT your kitchen sink to work for more efficient print washing. The common custom is to set a tray in the sink under the running water. For the occasional washing of a few prints, this makeshift method will do, although efficient washing is obtained in a better way. For those who turn out large quantities of prints in limited space, the washing capacity can be increased ten times, by utilizing the sink as suggested here.

A handy and inexpensive drain can be constructed from the flexible rubber cup of an ordinary sink plunger and a handful of hairpins purchased in the ten-cent store. The idea is simple to grasp and the whole thing can be made in a few minutes.

The first step is to remove the wooden handle; see Fig. 1. Then, with a sharp knife, cut away the thin wall of rubber that is located in the base of the neck from which the wooden handle was removed; see Fig. 2.

Next, four large hairpins, or any suitable pieces of wire bent to proper shape, are inserted in the top of the neck as illustrated in Fig. 3. This wire "fence" will keep prints from inadvertently blocking off the overflow. Any chance of the sink running over is thus avoided.

Above: Fig. 4. Showing the completed drain and inlet hose. Longer hose increases water circulation. Be certain sink is clean before washing your photographs.

Above: Fig. 2. Cut away the thin wall of rubber in the base of the neck with a sharp knife, as shown.

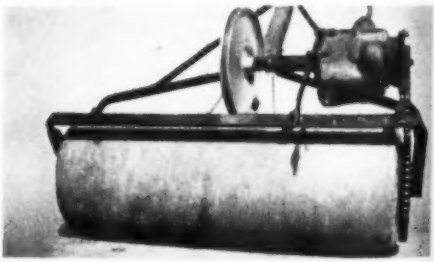
Above: Fig. 3. Four large hairpins in the top of the neck prevent prints from clogging the outlet.

The assembly is now complete and can be put to use at once by placing it in position over the drain of the sink; see Fig. 4. Incidentally the rubber hose from the faucet, as shown in Fig. 4, reaches to within a half inch from the bottom of the sink. A longer hose increases water circulation and speeds up the washing process.

"ROLLAWN" - Economical

MANY a man who has to take care of a large lawn has labored with a lawn roller that was too heavy to push and much too light to do a good job of rolling. After many years of this needless exertion the writer decided that the motor from the power lawn mower might just as well do this if the proper application could be made. The result of this decision is a lawn roller that weighs nearly four hundred pounds and rolls a width of 30-inches. It runs backward as well as forward so that all you need to do when you reach the edge of the lawn is shift the gears and go back across again. For the average handy-man the joy of building this machine is almost as great as the thrill he gets in using it. Those little bumps in the lawn just disappear under this machine as it moves over the ground.

Lets make the roller first. Most hot water tanks give out first at the bottom so it is not



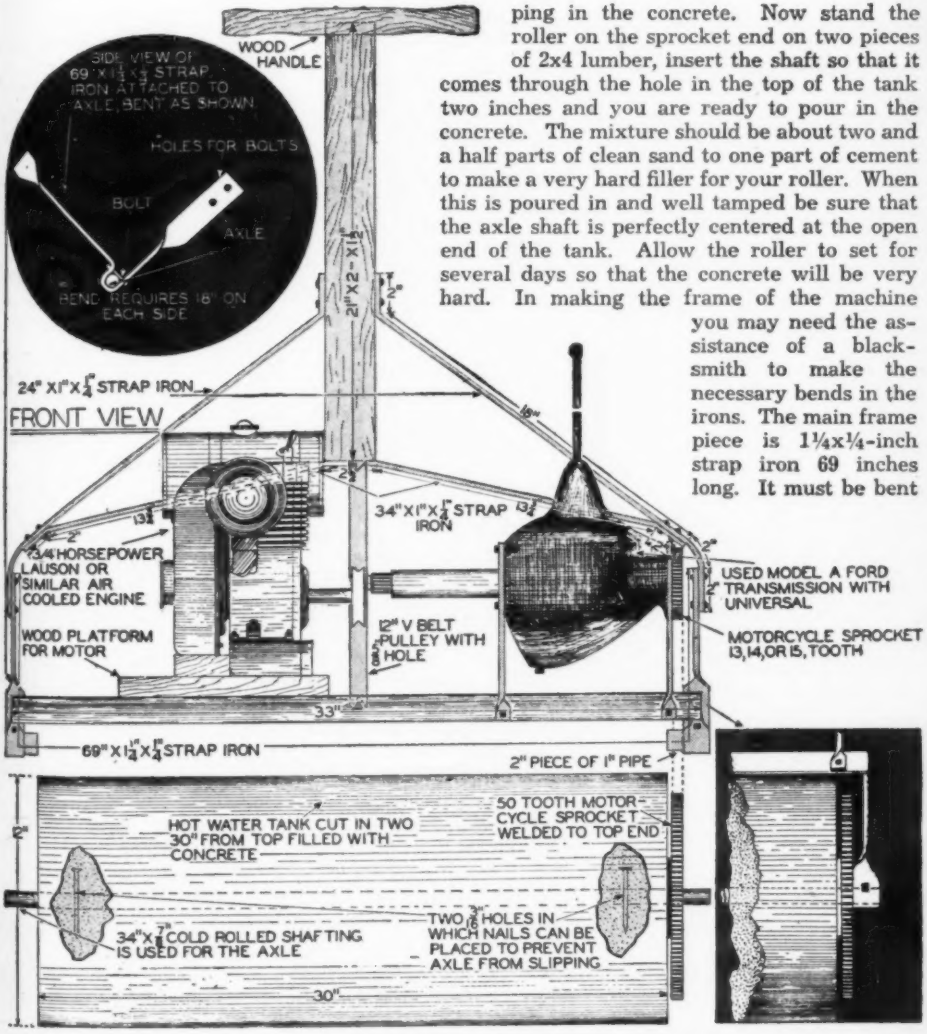
Top: The roller in action. Weighing about 400 lbs., it will smooth out lumps in the ground like magic. With the exception of the motor, which is of the air-cooled type, ¾ h.p. with foot pedal starter, all parts are scrap. Note throttle control on handle, as well as clutch (see text). Above: The 30x12-inch boiler section with motorcycle sprocket welded in place. Right above: Roller partly assembled. Ford "A" transmission and V-belt pulley have been attached. Right: Back view of completed roller.

Powered Lawn Roller

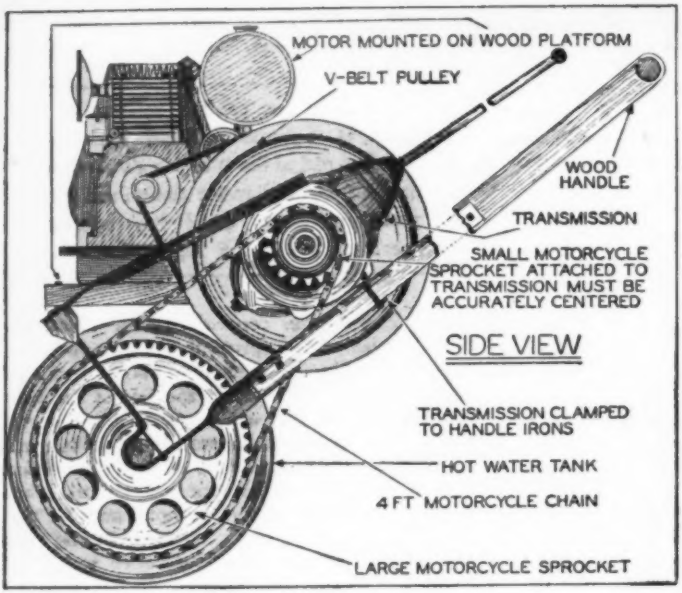
by Fred Palmer

Normally, the proper rolling of a lawn is a backbreaking task, but with the aid of the inexpensive, easily made powered roller described here you can do a good job with no more effort than a flip of the wrist.

hard to find one that is good from the middle up. Have this cut in two, 30 inches from the top. To the top end weld a fifty-tooth motorcycle sprocket, making sure it is accurately centered. A 34-inch piece of 7/8-inch cold rolled shafting is used for the axle and should have two 3/16-inch holes in which nails can be placed to keep the shaft from turning or slipping in the concrete. Now stand the roller on the sprocket end on two pieces of 2x4 lumber, insert the shaft so that it comes through the hole in the top of the tank two inches and you are ready to pour in the concrete. The mixture should be about two and a half parts of clean sand to one part of cement to make a very hard filler for your roller. When this is poured in and well tamped be sure that the axle shaft is perfectly centered at the open end of the tank. Allow the roller to set for several days so that the concrete will be very hard. In making the frame of the machine you may need the assistance of a blacksmith to make the necessary bends in the irons. The main frame piece is 1¼x¼-inch strap iron 69 inches long. It must be bent


SIDE VIEW OF 69"X1½"X¼" STRAP IRON ATTACHED TO AXLE, BENT AS SHOWN
HOLES FOR BOLTS
BOLT
AXLE
BEND REQUIRES 18" ON EACH SIDE
WOOD HANDLE
2"X2"-X14½"
2"
24" X1"X¼" STRAP IRON
FRONT VIEW
16"
2"
13½"
34"X1"X¼" STRAP IRON
13½"
2"
3¾ HORSEPOWER LAUSON OR SIMILAR AIR COOLED ENGINE
WOOD PLATFORM FOR MOTOR
12" V BELT PULLEY WITH ⅝ HOLE
USED MODEL A FORD TRANSMISSION WITH UNIVERSAL
MOTORCYCLE SPROCKET 13,14,OR 15, TOOTH
33"
69" X1½"X¼" STRAP IRON
2" PIECE OF 1" PIPE
12"
HOT WATER TANK CUT IN TWO 30" FROM TOP FILLED WITH CONCRETE
50 TOOTH MOTORCYCLE SPROCKET WELDED TO TOP END
34"X⅞" COLD ROLLED SHAFTING IS USED FOR THE AXLE
TWO 3/16" HOLES IN WHICH NAILS CAN BE PLACED TO PREVENT AXLE FROM SLIPPING
30"

When filling the tank with cement, be sure that axle is accurately centered. The long strap iron frame is bent around axle as shown in black circle. Transmission is then attached to frame with pieces of iron, and motor is mounted on a wood platform (1-inch oak will do) which, in turn is fastened to frame.



Side view shows correct alignment of the various parts.

according to the sketch to form the support for the transmission, motor and handles on the axle bearings. The bearings consist of 2-inch pieces of 1-inch pipe which are clamped into the frame and slipped over the ends of the axle. If these bearings are babbitted it makes a much better job of it, but this is not absolutely necessary. Bolts through the frame piece clamp the pipes in place and we are ready to attach the handle irons and handle.

The Model A Ford transmission is now procured from the junk dealer and should have good low and reverse gears. The others don't matter, but you will also need part of the universal joint. Break the joint apart and cut the two prongs from the part which fits on the transmission spline shaft. Weld a sprocket of 13, 14 or 15 teeth to the end of this piece, being sure it is accurately centered and aligned. This pinion can now be placed on the spline shaft of the transmission and held there by the screw that held the universal. You are now ready to mount the transmission on the frame.

Place the transmission on the handle irons so that the gear shift lever is handy for the operator. You will need to change the lever by heating it and then bending it half way around. Using the holes where the emergency brake was bolted to the transmission, clamp it to the handle irons where it will line up the sprockets and clear the roller by about 1-inch. Two irons from the transmission to the front frame and a brace to the axle bearing complete this mounting. A 12-inch V-pulley with 5/8-inch hole is now fitted to the drive shaft of the transmission and you are ready to mount the motor. A wooden platform for this purpose is bolted to the front frame and handle irons.

The motor to be used may be a Lauson of 3/4 h.p. or any of the similar small motors available today. If steep places are to be rolled, however, the motor should be rated at about 1 horsepower. A smaller motor is shown in the pictures and it works very well on level lawns. There is a clutch assembly built on the shaft of this motor as it is taken from the power lawn mower, but a clutch can easily be made on any motor by arranging a third pulley on a lever that will tighten the belt when the lever is released at the handle of the roller. The machine can be operated without a clutch by jamming it into gear but this is rather hard on the various parts and a clutch is quite worth while.

In operation the roller is run back and forth across the lawn slowly to get best results. A slow walking gait will do a better job than a faster pace and will not be so hard on the roller. In order that the roller will stand in operating position when not in use, a leg can be attached to the handle and raised when the roller is in use. With this machine a man can roll from three to five acres a day with as little effort as it takes to mow the same area with a power lawn mower and the lawn will not only look better than ever but will be easier to mow all summer.

List of materials for "Rollawn"

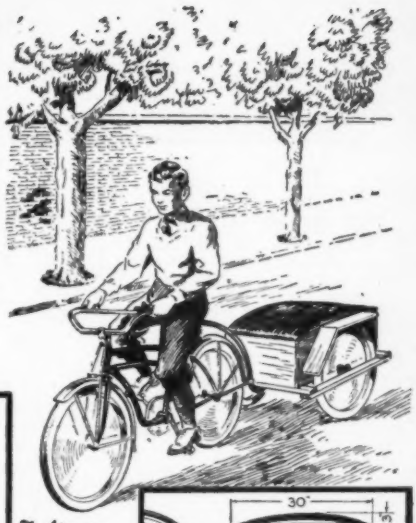
1 Used hot water tank top, 12"x30".
1 Used Model A Ford transmission with universal.
1 Large motorcycle sprocket (50 tooth).
1 Small motorcycle sprocket (13, 14 or 15 tooth).
4 ft. motorcycle chain for above.
1 12" v-belt pulley with 5/8" hole.

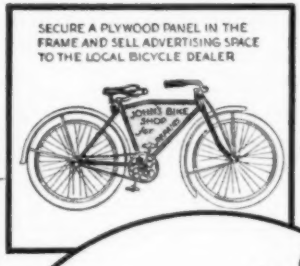
[*Continued on page* 143]

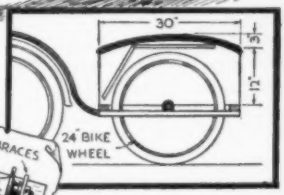
Kinks For Bicyclists

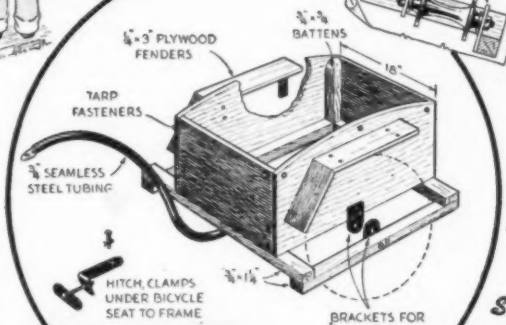
HERE are a few ways to get more pleasure out of your bike, and possibly a little income. A plywood or wallboard panel in the frame offers advertising space of value to local shop keepers. The trailers shown are simple in design and construction and very useful for after-school delivery service or for picnic excursions. The bike garage shown eliminates the possibility of damage by cars in the household garage. The repair stand below affords an ideal means to repair the bike or its tires without the inconvenience of having to hold the wheel

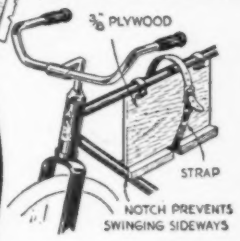
[*Continued on page* 145]

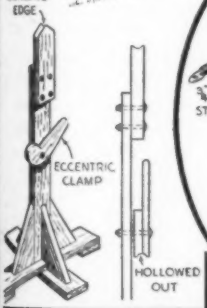


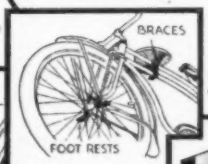




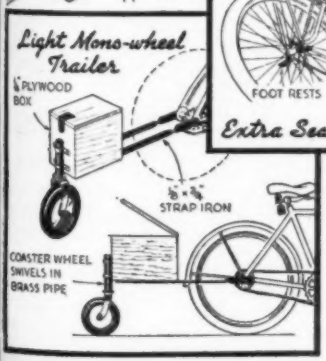


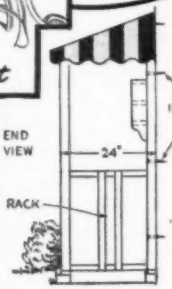






BODY ¼" OUTDOOR PLYWOOD SECURE TO BATTENS WITH SCREWS AND CASEIN GLUE





BUILD "WEE WILLIE"

FRONT DRIVE MIDGET MODEL RACER

WHEN the automobile was comparatively new in this country the gay blade who sported one of these "horseless carriages" was considered not only a daring gentlemen but also a man of means. Today the "horseless carriage" has been perfected to a degree that would have caused our gay blade to gape in wonder, and the price is within the means of every aspiring automobile owner. The moral in this story also applies to the model race car. This sport which is comparatively new is destined to become one of the most up and coming hobbies of the time, because it offers not only mental relaxation but keen practical enjoyment as well. The car we so proudly present has all the advantages of a higher priced model but the cost is from one-half to two-thirds less—a saving of about $15 to $20. The features of this car can only be fully appreciated after its completion, since theoretical advantages often do not work out in actual practice.

Here is a miniature racing car that can set and hold a breakneck pace that would leave the Indianapolis champions in the dust, if it could grow to their size and increase its speed proportionally. The front wheel drive affords excellent traction at the high velocity attained, and yet requires no increase in weight. The cost of building this champion model is only a fraction of the cost of many similar cars of competitive performance.

Chassis Construction

Before actual construction is under way it is not only best but necessary to study the plans carefully to obtain a general idea as to its design. The drawings are half-size which accounts for the fact that very few measurements are given. Should you want to complete your car a bit sooner, the full size blueprints, which are available, will save you much time which ordinarily would be used in doubling the size of the various parts.

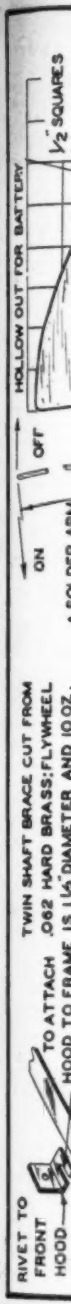
The chassis is bent from one continuous length of ½" hard angle aluminium or dural. To bend around the nose, file down the front about ¼" which will permit bending a nice even curve, then rivet the two ends together where indicated. Throughout the entire construction use ⅜" aluminum rivets cut down when required.

The one-piece chassis will stand up just as well as many of the cast aluminium chassis, since the metal when stressed will bend but will not break. File the notches where the flywheel and main gear are stationed and then proceed with the making of the axle housing and chassis plates.

The axle housings vary in length with the front housing ¼" longer than the rear one. Cut them both from ¼" inside diameter hard brass tubing, allowing an extra ½" for the flanging process. To flange the housings, file down one end leaving a section about ¼" wide. Then bend these at right angles with the housing wall.

Next cut from $\frac{1}{16}$" hard sheet brass, the four chassis plates. Drill holes $\frac{5}{16}$" in diameter to fit the outside diameter of the housing and place the flayed housing between the chassis plate and chassis rail. Rivet the front plate to the rail with ¼" copper rivets countersunk, and the rear plate with ½" aluminium rivets since the front is stressed more than the rear with a front drive. As an extra precaution solder the housing to the plate as vibration will tend to loosen every conceivable part.

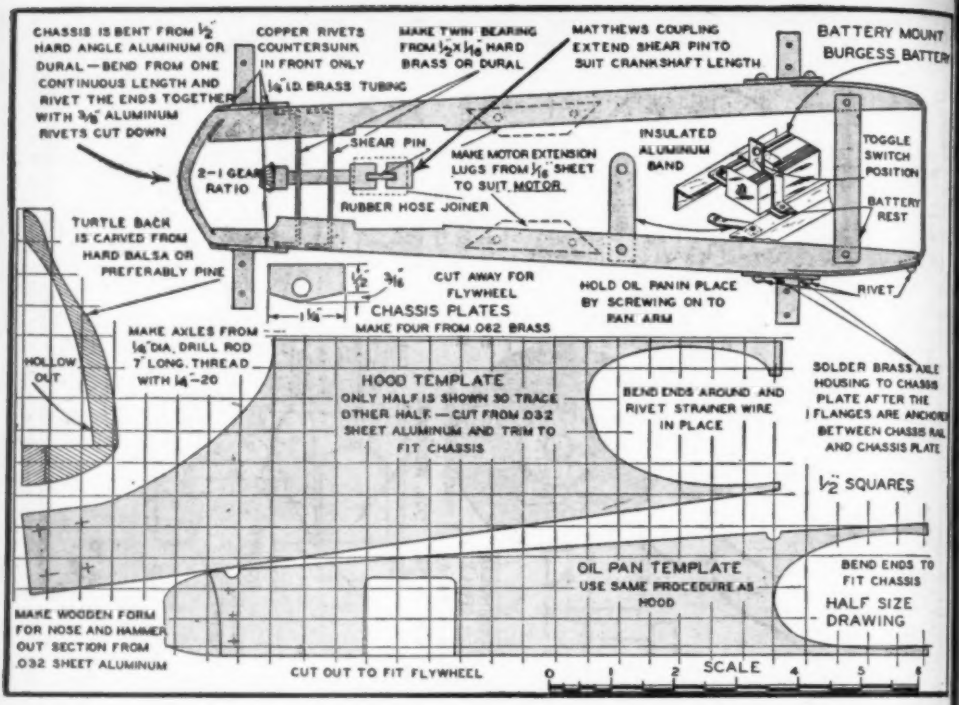
Our next job is to cut the shaft braces and motor extension lugs from $\frac{1}{16}$" sheet brass and set into position. Drill the hole carefully in both cases since the slightest inaccuracy will cut down the final speed. The extension shaft depends upon the length of your crankshaft so use your own judgment where this is concerned. One word, however, use ¼" stock and turn down one end to $\frac{3}{16}$" since the pinion gear used has this size hole in it. The coupling used to join the motor shaft and


½" SQUARES
HOLLOW OUT FOR BATTERY
OFF
ON
TWIN SHAFT BRACE CUT FROM .062 HARD BRASS; FLYWHEEL
TO ATTACH HOOD TO FRAME IS 1½" DIAMETER AND 10 OZ.
RIVET TO FRONT HOOD

former

RIVET TO FRONT HOOD
CHASSIS RAIL
ALUMINUM RIVET SET HALF WAY IN
TO ATTACH HOOD TO FRAME SLIDE SLOT FITTING INTO RIVET HEAD
TWIN SHAFT BRACE CUT FROM .062 HARD BRASS: FLYWHEEL IS 1½" DIAMETER AND 10 OZ. IN WEIGHT. ½" HUB DIAMETER
2½" VOIT AIRWHEELS
CUT OPENING IN OIL PAN TO PERMIT USE OF BICYCLE STARTING MOTOR
FLYWHEEL
DRILL HOLES FOR BRIDLE
EXHAUST IS OPTIONAL SINCE ALL MOTORS HAVE DIFFERENT PORT POSITION
COIL POSITION
SOLDER ARM TO TOGGLE SWITCH
ON
OFF
BURGESS 3V BATTERY
HOLLOW OUT FOR BATTERY
½" SQUARES
SCREW HOOD TO WOODEN TURTLE-BACK—REMOVE ENTIRE BODY WHEN SERVICING MOTOR
SNAP-CATCH
HARD BALSA OR PINE
CHASSIS REAR
ATTACH TO REAR
METHOD OF HOOD ATTACHMENT
DRAWING IS HALF SIZE
SCALE
0 1 2 3 4 5 6
FRONT DRIVE REQUIRES THE USE OF THRUST BALL BEARINGS
ON BOTH SIDES OF HUBS SCREW ¼-20 NUTS TO HOLD WHEELS SECURE & TO ADJUST GEARS
INSERT BETWEEN CHASSIS RAIL AND CHASSIS PLATE—MAKE FROM HARD BRASS
AXLE HOUSING ATTACHMENT
OIL HOLES
MAKE AXLE HOUSING ½" LONGER TO PERMIT FLANGING
SOLDER
RIVET
CUT FROM .032 ALUMINUM
¾"
ACORN NUT
WHEN USING VOIT AIR WHEELS CUT HUBS IN HALF AND FILE DOWN ⅛". THE TIRES WILL THEN FIT ON THE HUB SNUGLY

Side and top views of car, showing general construction and power plant location.


CHASSIS IS BENT FROM ½" HARD ANGLE ALUMINUM OR DURAL — BEND FROM ONE CONTINUOUS LENGTH AND RIVET THE ENDS TOGETHER WITH 3/16" ALUMINUM RIVETS CUT DOWN
COPPER RIVETS COUNTERSUNK IN FRONT ONLY
¼" I.D. BRASS TUBING
MAKE TWIN BEARING FROM ½" X 1/16" HARD BRASS OR DURAL
MATTHEWS COUPLING EXTEND SHEAR PIN TO SUIT CRANKSHAFT LENGTH
BATTERY MOUNT
BURGESS BATTERY
SHEAR PIN
2-1 GEAR RATIO
MAKE MOTOR EXTENSION LUGS FROM 1/16" SHEET TO SUIT MOTOR
INSULATED ALUMINUM BAND
TOGGLE SWITCH POSITION
BATTERY REST
RUBBER HOSE JOINER
TURTLE BACK IS CARVED FROM HARD BALSA OR PREFERABLY PINE
½"
3/16"
1½"
CUT AWAY FOR FLYWHEEL
CHASSIS PLATES
MAKE FOUR FROM .062 BRASS
HOLD OIL PAN IN PLACE BY SCREWING ON TO FAN ARM
RIVET
MAKE AXLES FROM ¼" DIA. DRILL ROD 7" LONG. THREAD WITH ¼"-20
HOLLOW OUT
HOOD TEMPLATE
ONLY HALF IS SHOWN SO TRACE OTHER HALF — CUT FROM .032 SHEET ALUMINUM AND TRIM TO FIT CHASSIS
BEND ENDS AROUND AND RIVET STRAINER WIRE IN PLACE
SOLDER BRASS AXLE HOUSING TO CHASSIS PLATE AFTER THE I FLANGES ARE ANCHORED BETWEEN CHASSIS RAIL AND CHASSIS PLATE
½" SQUARES
OIL PAN TEMPLATE
USE SAME PROCEDURE AS HOOD
BEND ENDS TO FIT CHASSIS
HALF SIZE DRAWING
MAKE WOODEN FORM FOR NOSE AND HAMMER OUT SECTION FROM .032 SHEET ALUMINUM
CUT OUT TO FIT FLYWHEEL
0 1 2 SCALE 4 5 6

Chassis details and outline of body pattern shapes drawn to scale.

the extension shaft is a Matthews coupling. You may lengthen the shear pin to suit your engine length. Use a 10 ounce 1½" diameter flywheel since the chassis requires such a size.

After making both axles from ¼" drill rod and threading the ends with ¼-20 thread you may set the main gear into position so that it meshes perfectly with the pinion gear. On each side of the housing end place any small thrust type ball bearings and then screw on ¼-20 nuts inside the wheels, to prevent the axle from shifting horizontally, and outside to hold the wheels on. The gears can be set perfectly since the tightening of the nuts on whatever side needed will shift the large gear to the desired position. The pinion gear may be regulated by lengthening and shortening the shear pin.

Mount the motor in position with 4-32 nuts and bolts ¾" in length and place lock washers on them. Next mount your coil by cutting from $\frac{1}{16}$" sheet aluminium a band 1" larger than the circumference of the coil. Insulate thoroughly with insulating tape and bolt the entire unit into position. The battery mount is also made from $\frac{1}{16}$" aluminium and uses the same principle as the coil mount. Make the square band to fit your battery which is in our case a Burgess battery. Mount a toggle switch directly above the battery and solder an arm to the head so that the car may be stopped by cutting the switch while the car speeds in its circular course.

Since special race car wheels are not available in 2½" diameters use Voit airwheels. To make a tight fit between the tire and hub cut the hub in half and file from each section ⅛". When the hubs and tires are set together again a nice sturdy fit will result. Screw ¼-20 nuts cut in half on the outside and lock with standard ¼-20 acorn nuts.

Hood and Oil Can

Before bending the hood into shape cut the turtleback from hard balsa or pine. Hollow out to allow space for the battery. Now cut the hood from .032 sheet aluminium as shown in the template, and bend into shape. The "radiator" grille is made from screening and riveted in place. In all probability you will have to shape your hood to fit your motor and

[*Continued on page* 141]

THE RED ROCKET RACER

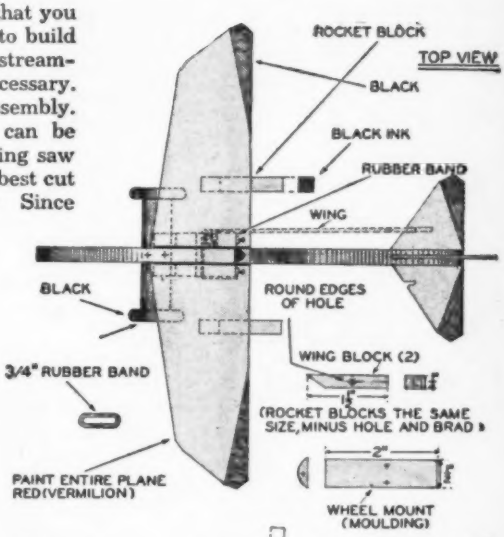
A Folding-Wing Rocket Ship

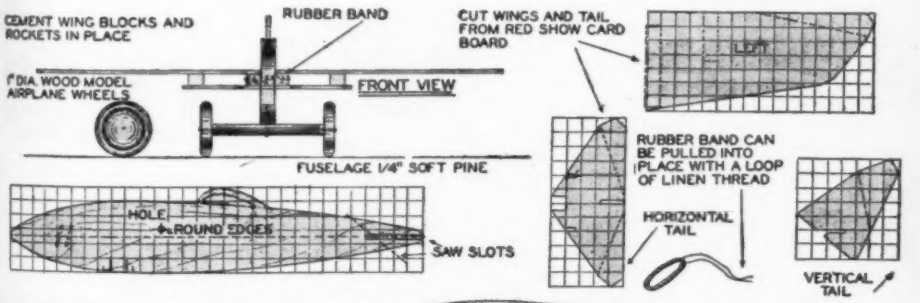
SOFT wood and show cardboard are all that you need aside from a few odds and ends, to build this sleek rocket ship. For the modern streamlined hangar, only the show cardboard is necessary. Model airplane cement is used in the assembly.

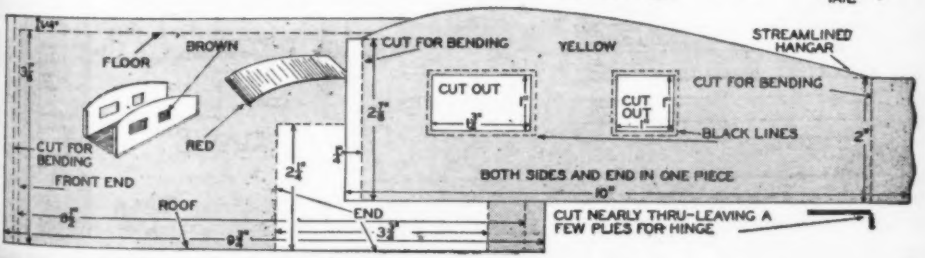
As the fuselage is only ¼" thick, it can be whittled to shape with a penknife if a coping saw is not available. The cardboard wings are best cut to shape with a single-edge razor blade. Since there are no curves in the outline this cutting is very simple.

A hole must be bored in the fuselage at the point indicated in the drawing, to take the rubber band that holds the wings in place. Wing blocks are glued to the inner ends of the wings as shown. These blocks are also drilled to take the rubber band which is looped around a brad at the rear end of each wing block. The band can be drawn through all these holes with a piece of linen thread looped around it. Perhaps the best way to do this is to hook the rubber band around the brad on one wing block and then draw the other end through the two blocks and the body to hook it to the brad on the other block. The rocket blocks are the same size and shape as

[*Continued on page* 142]

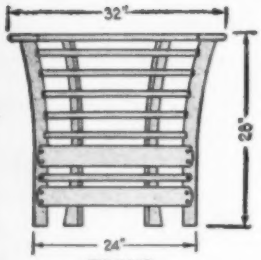


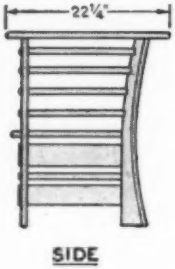

CEMENT WING BLOCKS AND ROCKETS IN PLACE
RUBBER BAND
1" DIA. WOOD MODEL AIRPLANE WHEELS
FRONT VIEW
FUSELAGE 1/4" SOFT PINE
HOLE
ROUND EDGES
SAW SLOTS
CUT WINGS AND TAIL FROM RED SHOW CARD BOARD
LEFT
RUBBER BAND CAN BE PULLED INTO PLACE WITH A LOOP OF LINEN THREAD
HORIZONTAL TAIL
VERTICAL TAIL

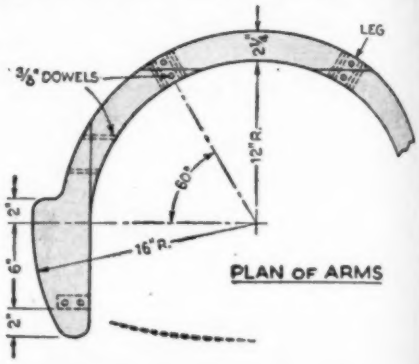


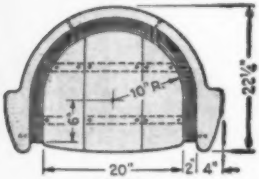
A WEATHERPROOF LAWN

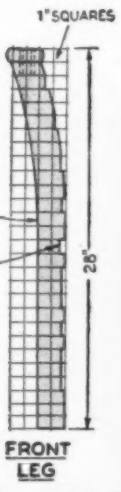
No Extra Covering Needed For

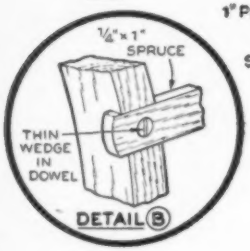


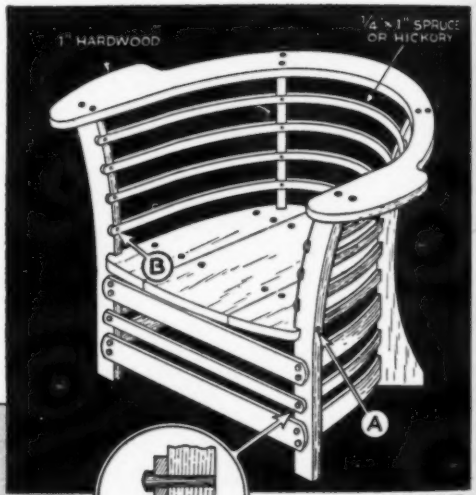


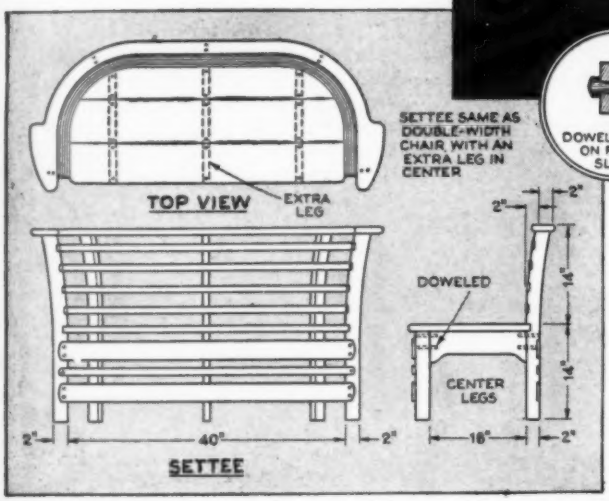


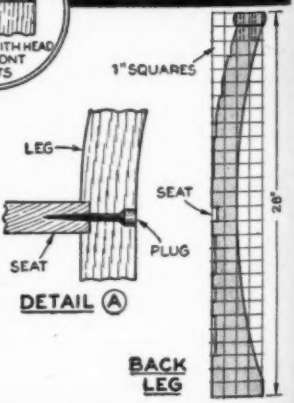








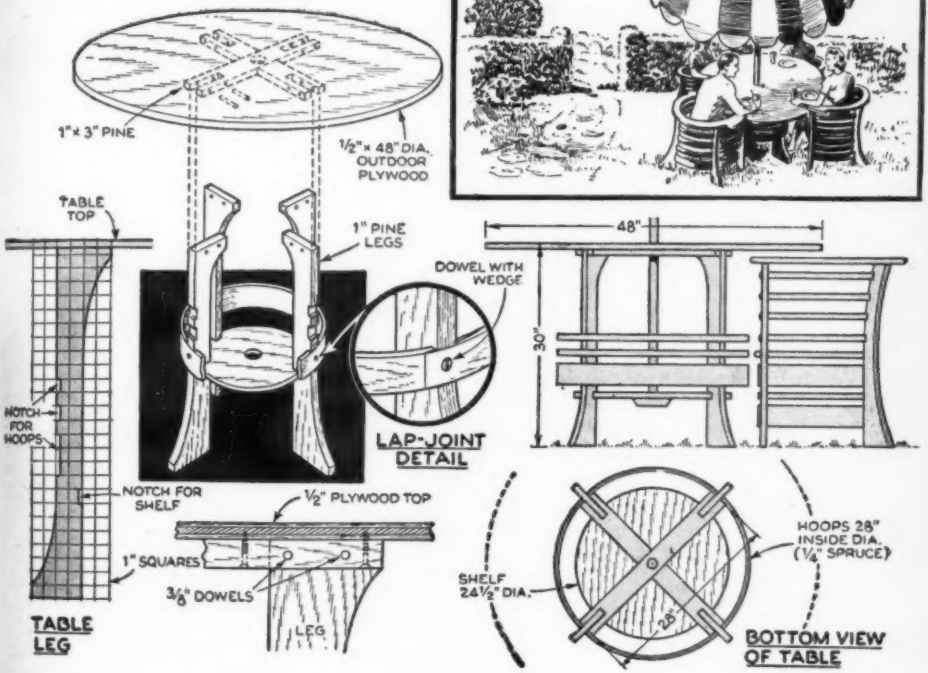




FURNITURE SET

This Durable Combination

by Hi Sibley



THIS set of table, four chairs and settee is designed for simplicity of construction, and is so built that it will withstand any kind of weather. In fact, the more it is exposed to the elements the more attractive it will become with the softening tones of the unpainted wood. With the exception of a screw through each leg into the seat, assembly is entirely with dowels tightened with thin hardwood wedges, and casein glue. Some screws are also used in the cleats in the underside of the table.

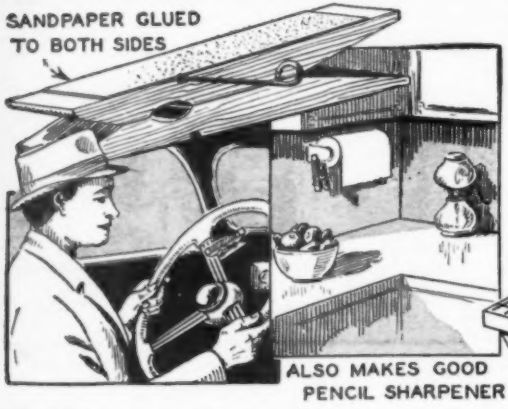
Squared profiles of the legs are shown, and once a pattern is made it is a simple matter to turn out all the front legs at a time, and similarly with the rear ones for chairs and settee. One-inch pine (net) is used for all construction except hardwood for the arms, and of course the spruce or hickory slats for chair backs. The slats should be steamed or soaked overnight in water before bending—and to make them uniform, a wood form might be used. This last will not be necessary if the wood is soaked evenly and has vertical grain. Soaking can be done in a fish pond, trough, or length of iron pipe. In the latter case the pipe can be tilted at an angle and a fire built under the lower end to boil the water.

The bent slats are secured with dowels, as shown, and to tighten them a thin hardwood wedge is driven in, first having made a start with a chisel. Casein glue is applied in all joints.

The settee is exactly like the chair except that it is double-width and has an extra leg in the center. Also, the seat boards are laid lengthwise, with the cleats underneath, glued and dowelled.

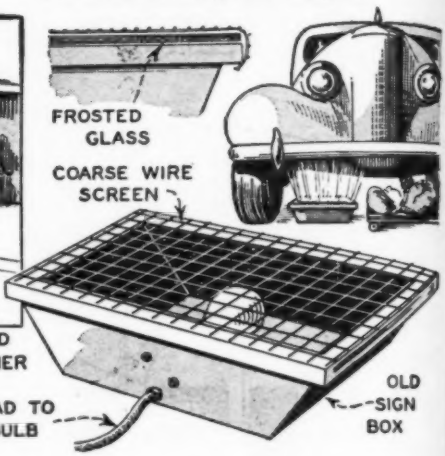
[*Continued on page* 142]

Handy Match Scratcher



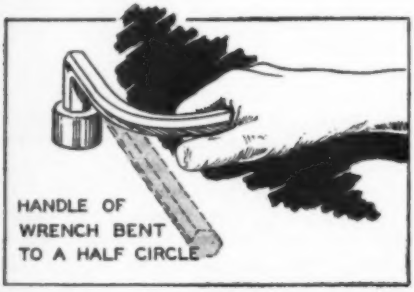
IF YOU smoke while driving or while doing anything that occupies one hand, this scratch-paper holder will prove handy. It is made from a clothespin of the type shown, with sandpaper glued to both sides. Even in places where both your hands are likely to be free, such as the kitchen or the living room, these little gadgets will be convenient and may be clamped anywhere.—*A.H.W.*

Old Sign Box Makes A Good Repair Light



AN OLD sign box can easily be converted to an effective repair light by simply covering the open front with heavy protective mesh. Frosted glass inserted beneath the screening prevents glare. The illumination provided by this light is far superior to a "trouble light."—*J. M.*

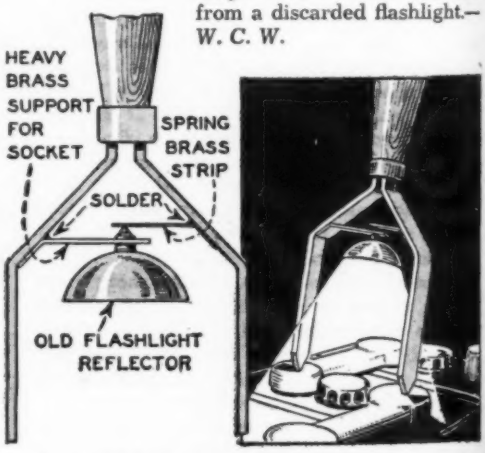
A Good Wrench For Tight Spots



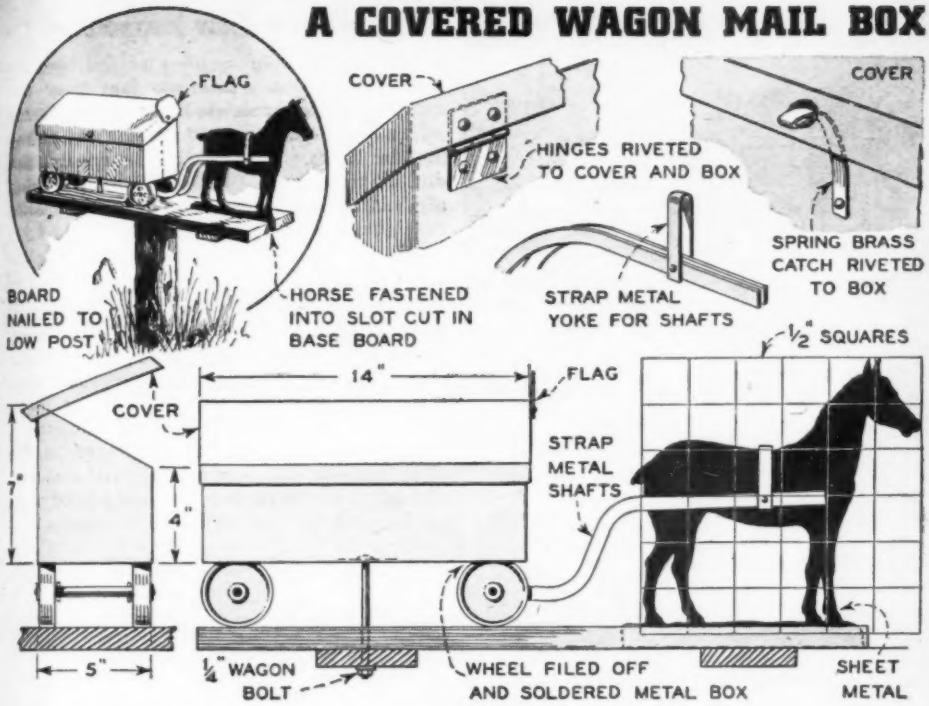
A WRENCH to reach the "knuckle-skinning" spots around automobile generators and starters can be simply made by bending an ordinary socket wrench handle into a segment of a circle as illustrated. For tightening up or loosening nuts and bolts in almost inaccessible locations, these wrenches may be bent to a variety of specially suited shapes.—*A. H. W.*

Battery Lamp Made From Old Tester

AN OLD battery discharge tester will make an excellent inspection light for checking the fluid in the cells, etc. To convert it, use brass strips and an old reflector from a discarded flashlight.—*W. C. W.*



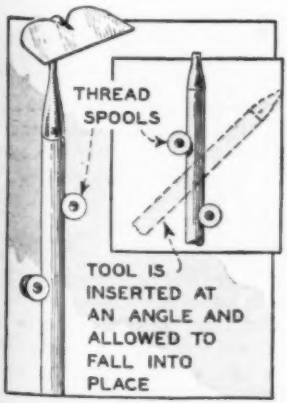
A COVERED WAGON MAIL BOX



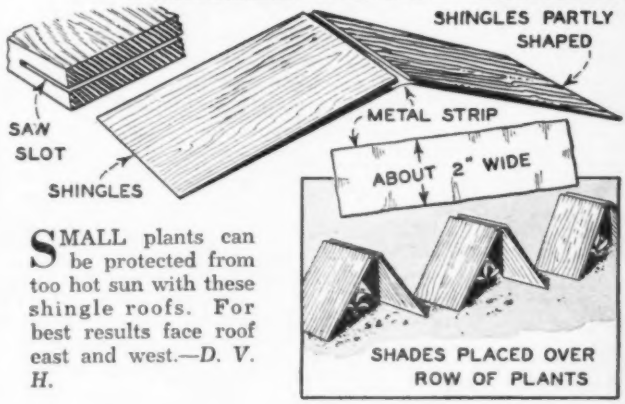
AN UNUSUAL mail box resembling a covered wagon can be made quite simply out of thin sheet metal as shown above. Any small toy wheels will be satisfactory. The wheels do not turn, however, their tops being sawed off flat and soldered to the bottom of the metal box wagon body. A small square of the same metal used throughout can be used as a signal flag.—*D. V. H.*

TOOL HANGER

A CONVENIENT garden tool hanger can be easily made from two empty thread spools nailed or screwed to the wall. They should be so placed that when the tool is at rest, it will be at a slight angle to the vertical.—*G. E. H.*

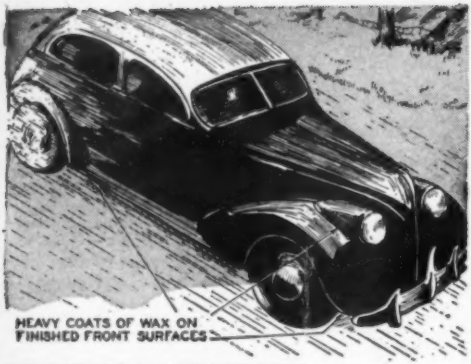


SHINGLE PLANT SHADES



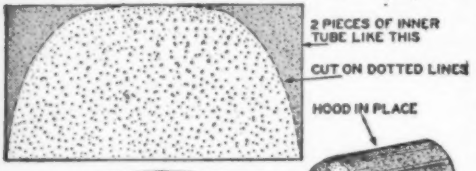
SMALL plants can be protected from too hot sun with these shingle roofs. For best results face roof east and west.—*D. V. H.*

Wax Keeps Car Bug-Free

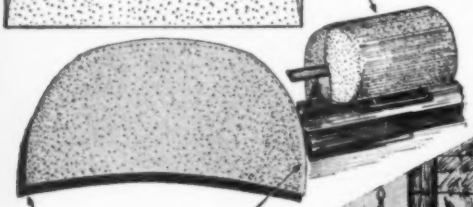


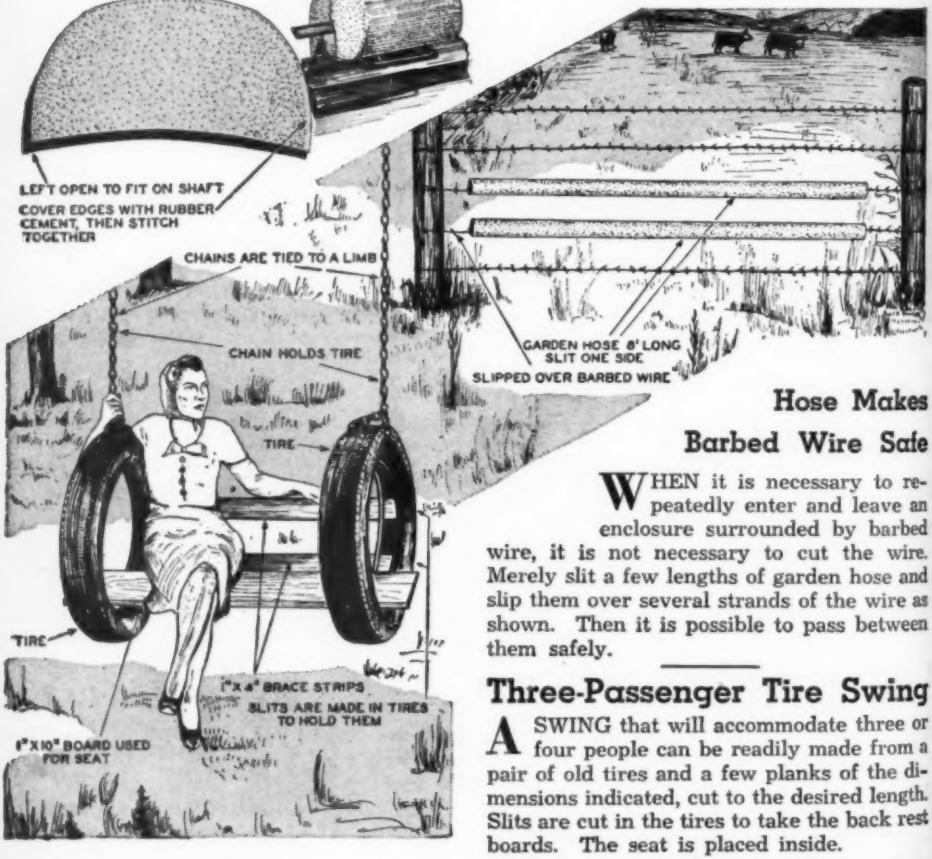
IN A great many sections of the country insects are so numerous that they are troublesome to motorists by battering themselves against the front of the car and staining the finish. These stains, or specks, are difficult to remove. Waxing but not polishing all the finished front portions of the car makes their removal easy after a trip.

Tire-Tube Motor Hood



ELECTRIC motors for farm appliances are frequently installed in unsheltered places, such as pump platforms, etc. A simple and effective protective hood can be made from an old inner tube. The tube is first cut into two pieces of the shape shown in the drawing, and of a size suited to the motor. The edges of the rubber are then joined with rubber cement and stitching as shown.




CHAINS ARE TIED TO A LIMB
CHAIN HOLDS TIRE
TIRE
TIRE
1"X4" BRACE STRIPS
SLITS ARE MADE IN TIRES TO HOLD THEM
1"X10" BOARD USED FOR SEAT
GARDEN HOSE 8' LONG SLIT ONE SIDE
SLIPPED OVER BARBED WIRE

Hose Makes Barbed Wire Safe

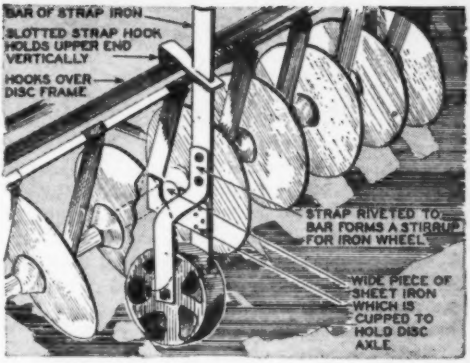
WHEN it is necessary to repeatedly enter and leave an enclosure surrounded by barbed wire, it is not necessary to cut the wire. Merely slit a few lengths of garden hose and slip them over several strands of the wire as shown. Then it is possible to pass between them safely.

Three-Passenger Tire Swing

A SWING that will accommodate three or four people can be readily made from a pair of old tires and a few planks of the dimensions indicated, cut to the desired length. Slits are cut in the tires to take the back rest boards. The seat is placed inside.

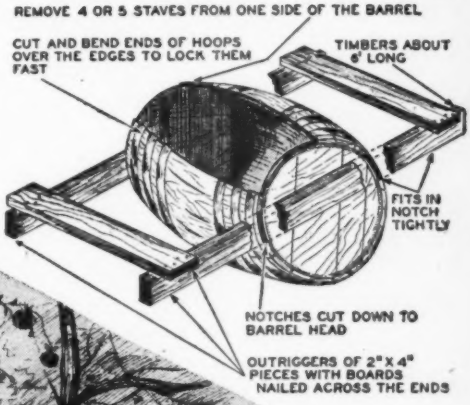
Protector-Wheels For Discs

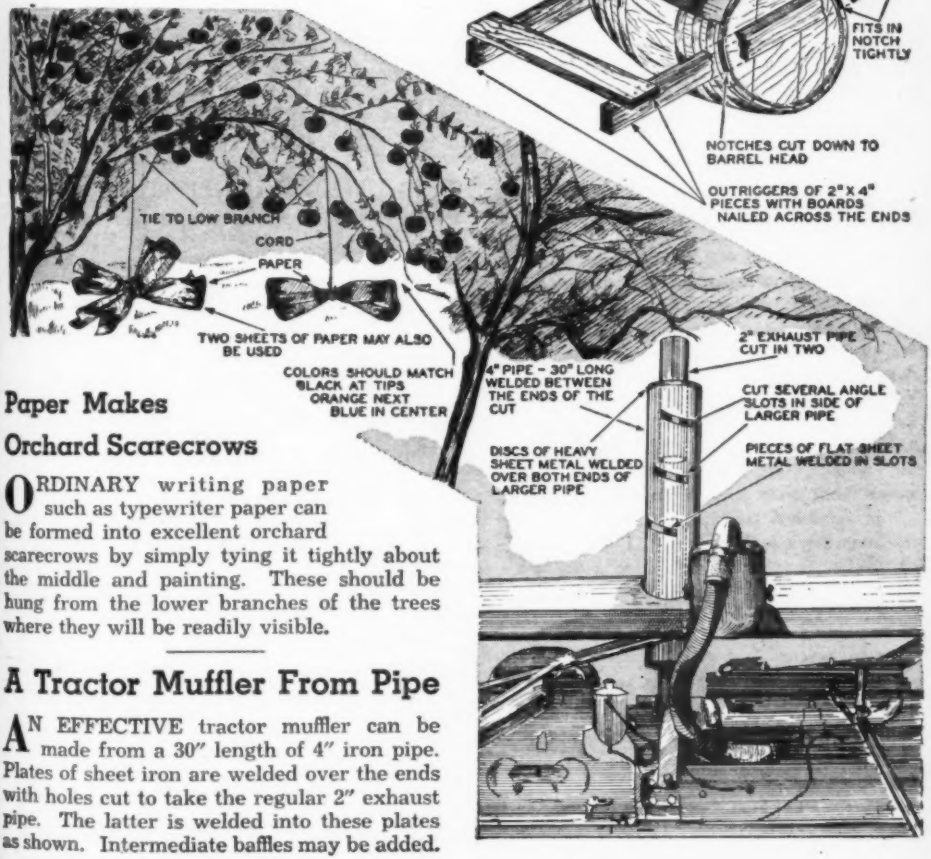
DISCS can be protected during the trip to and from the field by these simple homemade casters. Construction is of strap iron and sheet iron throughout. A device of this type is particularly useful where it is frequently necessary to haul the discs for a distance over the highway. The wheels are easily removed.


BAR OF STRAP IRON
SLOTTED STRAP HOOK HOLDS UPPER END VERTICALLY
HOOKS OVER DISC FRAME
STRAP RIVETED TO BAR FORMS A STIRRUP FOR IRON WHEEL
WIDE PIECE OF SHEET IRON WHICH IS CUPPED TO HOLD DISC AXLE

An Outrigger Barrel Raft

AN OLD barrel will make a good raft if adapted as shown. Several staves must be cut out, including the one with the bung hole. The hoops must be cut and bent over the edges of the "cockpit" staves to prevent the barrel from coming apart. Notches should be cut in the protruding ends of the staves at the barrel ends, for the outrigger arms.


REMOVE 4 OR 5 STAVES FROM ONE SIDE OF THE BARREL
CUT AND BEND ENDS OF HOOPS OVER THE EDGES TO LOCK THEM FAST
TIMBERS ABOUT 6' LONG
FITS IN NOTCH TIGHTLY
NOTCHES CUT DOWN TO BARREL HEAD
OUTRIGGERS OF 2" X 4" PIECES WITH BOARDS NAILED ACROSS THE ENDS


TIE TO LOW BRANCH
CORD
PAPER
TWO SHEETS OF PAPER MAY ALSO BE USED
COLORS SHOULD MATCH BLACK AT TIPS ORANGE NEXT BLUE IN CENTER
2" EXHAUST PIPE CUT IN TWO
4" PIPE - 30" LONG WELDED BETWEEN THE ENDS OF THE CUT
CUT SEVERAL ANGLE SLOTS IN SIDE OF LARGER PIPE
DISCS OF HEAVY SHEET METAL WELDED OVER BOTH ENDS OF LARGER PIPE
PIECES OF FLAT SHEET METAL WELDED IN SLOTS

Paper Makes Orchard Scarecrows

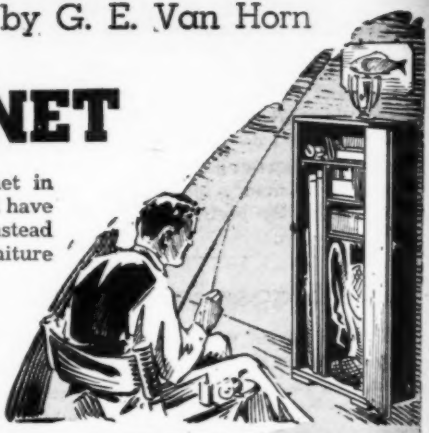
ORDINARY writing paper such as typewriter paper can be formed into excellent orchard scarecrows by simply tying it tightly about the middle and painting. These should be hung from the lower branches of the trees where they will be readily visible.

A Tractor Muffler From Pipe

AN EFFECTIVE tractor muffler can be made from a 30" length of 4" iron pipe. Plates of sheet iron are welded over the ends with holes cut to take the regular 2" exhaust pipe. The latter is welded into these plates as shown. Intermediate baffles may be added.

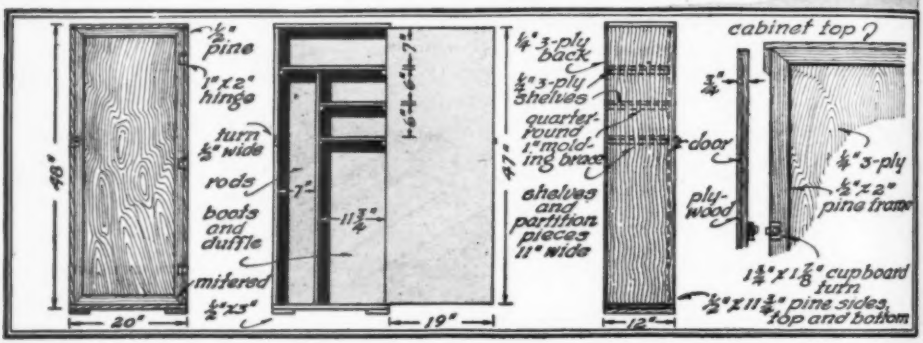
FISHERMAN'S TACKLE CABINET

by G. E. Van Horn



WITH this inexpensive and attractive cabinet in your den or corner of the basement, you will have a place for all your fishing tackle and equipment instead of some vague corner in the attic with the furniture relics and old magazines. Stained and varnished, the whitepine and plywood case is not pretentious, but will harmonize with your den furniture and give years of service.

Use ½-in. pine for the top, sides, and bottom, and ¼-in. three-ply wood for the door panel,



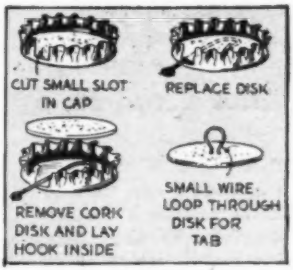
back panel, partitions, and shelves. The pine frame consists of top and bottom pieces, each 11¾-in. wide and 20-in. long, while the sides are each 11¾-in. wide and 47-in. high. Fasten the pine frame together with 1-in. screws. Since plywood usually comes in 3x5 and 4x8 foot sections, get two 3x5 sections, cutting the back panel from one and the door panel from the other. The back is 20-in. wide and 48-in. high, the panel being fastened to the back with screws or finishing nails.

The recessed partition and shelves are cut from plywood, and are 11-in. wide, to permit the door to close flush with the front edge of the pine frame. The arrangement of partition and shelves suggested in the working drawing can be altered to suit your needs. The drawing shows a vertical compartment about 40-in. high and 7-in. wide for jointed rods and cases, jointed net handles, and similar equipment, together with a wide shelf at the top and two shorter shelves, leaving a space under the shelves for boots or waders, nets, and other gear.

Brace the ends of the shelves with strips of wood or quarter-round 1-in. picture molding which is nailed (small finishing nails) to the shelves before they are assembled. Assemble the shelves and partition before placing them in the cabinet. Use screws to fasten the molding braces to the sides of the cabinet on the inside, leaving the outer side of the cabinet unblemished with screw holes. The

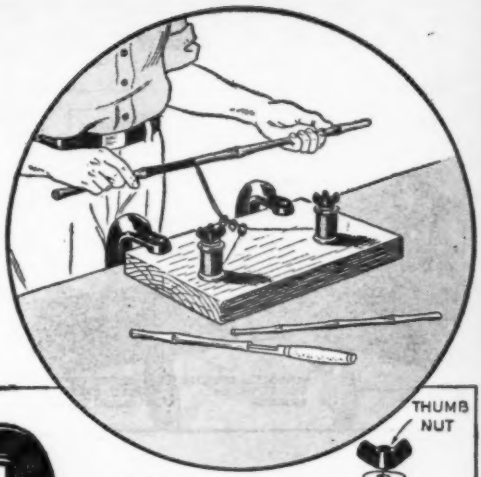
[*Continued on page 143*]

Bottle Cap Holds Fish Hook



VERY useful guard-holders for fish hooks can be made with ordinary bottle caps as shown at left. These will protect hands and save the points. —*A. H. W.*

Spool Holder For Wrapping Fishing Poles

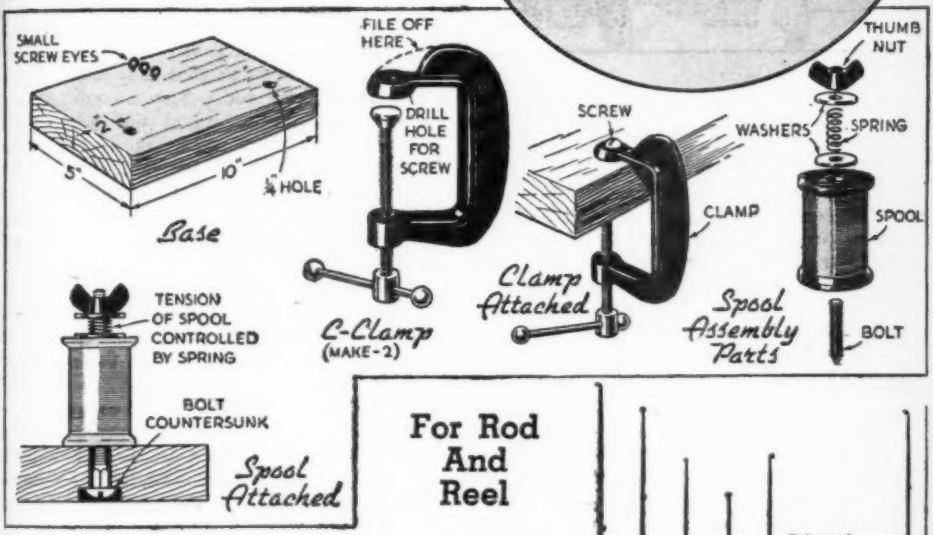


WITH this handy gadget, fishing poles and rods can be readily and easily wrapped in a professional manner. Any number of colored threads can be used.

The spools are put under tension by use of small springs tightened by means of thumb screws. The holder is made of a wood base drilled to take bolts over which the spools are fitted.

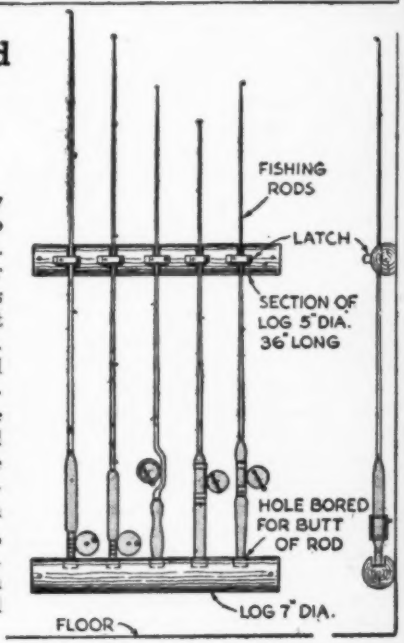
The clamps aid the fisherman in attaching

[*Continued on page* 145]



For Rod And Reel

THIS simple rustic rack will keep your rods neatly stacked in your den, or at camp. Saw off two sections of log, the upper log being from 4 to 5-in. thick and the lower log from 6 to 7-in. in diameter at the end. Flatten the curved surface of the logs with a plane or axe where they are fastened against the wall of the den or cabin. Saw slots about 1-in. deep and ¼-in. wide in the front of the upper log and whittle out pine latches as shown. Each latch is fastened to the log with a nail driven through a hole made by a larger nail so that the latches can be turned easily. Note that the latches are fastened near one end with the other end swinging over the notch, securing the rods. The sections of logs should be from 36 to 40-in. long for a selection of four or five rods, the notches and corresponding latches spaced equally. Bore 1½-in. holes in the lower log to line up with the slotted log at the top. Fasten the logs to the wall about 4 feet apart.



PRACTICAL GADGETS FOR R

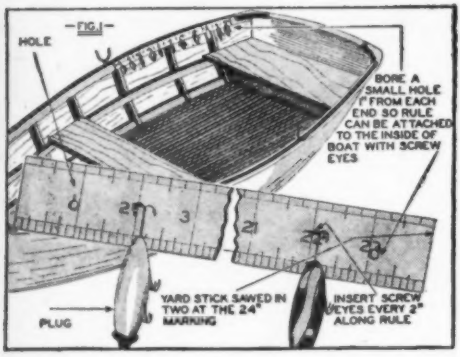


FIG. 1
HOLE
BORE A SMALL HOLE 1" FROM EACH END SO RULE CAN BE ATTACHED TO THE INSIDE OF BOAT WITH SCREW EYES
YARD STICK SAWED IN TWO AT THE 24" MARKING
INSERT SCREW EYES EVERY 2" ALONG RULE
PLUG

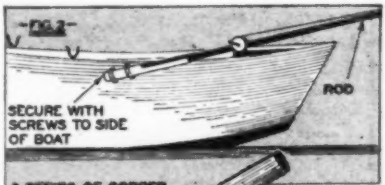
by Ben Trask

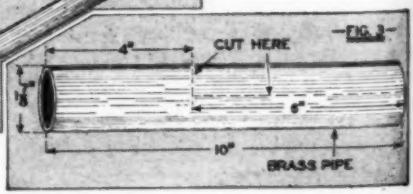
THOSE of us who seek our pleasures fishing from a rowboat are now putting our boats in order and laying on the finishing touches preparatory to the summer's fishing expeditions. A coat of paint, a few nails here and there, and the old boat is as good as new. However while you are at your job of repairing, here are a few ideas which may lend an added comfort to the bait, plug, or fly-fisherman. Take them for their worth and they will answer many of your problems.

For instance, here is one rowboat fisherman's convenience which has earned its simple installation many times over. It is a combined fish rule and plug holder. (See Fig. 1.) It is made from a common yard stick which has been sawed in two at the 24-in. mark. At a point, 1-in. from each end, bore a small hole so that the rule can be easily attached to the inside of the boat by means of two medium sized screw eyes. Insert smaller screw eyes every 2-in. along the rule, or if you should desire to attach the rule to the boat permanently use the larger screw eyes. As a means of avoiding a messy tangle of plugs and spoons I have found nothing to equal this combination. Not only will it serve as a handy lure hanger but it has the additional advantage of quickly measuring the fish that you catch.

Another equally useful gadget is a rod holder which can be attached to the side of the boat just ahead of an oar lock and within quick easy reach of the angler. (See Fig. 2.) The rod holder can be made from a section of your old aluminum rod case, or from a length of ordinary brass pipe, 10-in. long and with an inside hole 1⅞-in. in diameter. After you have cut a 10-in. piece of tube, measure off another 6-in. and saw through the tube half way, then starting at the short 4-in. end saw lengthwise through the tube to the first cut. When you have finished you will have a tube 6-in. in length and a half tube, which will act as a rod and reel rest, 4-in. in length. (Fig. 3.) Be sure to file off the sharp edges so that they will not cut or scratch your rod. The completed rod holder can be attached to the side of the boat at about a 25 degree angle by means of two braces. Two bolts, just long enough to penetrate through the boat side are excellent for the purpose. You can also use two strips of copper, similar to those used for a radio ground clamp. Wrap these around the tube tightly and then secure them with screws to the side of the boat. The rod holder will be well worth the trouble of making it especially if you go fishing alone and like trolling.

For years, and almost to the extent of insanity, I was annoyed by squeaky oar locks. However the problem was finally solved. The answer was simple and it was accomplished by merely forcing two brass sleeves, 2½-in. long, over the male oar lock post. (Fig. 4.) I'm not going to give you any further dimensions, of the sleeves, due to the many different sizes of oar lock posts. However this problem was solved simply by taking the locks to a plumbing shop to be fitted with the exact size of tubing necessary. A good point to remember is that



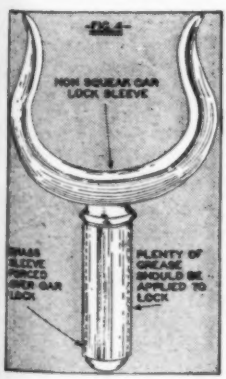


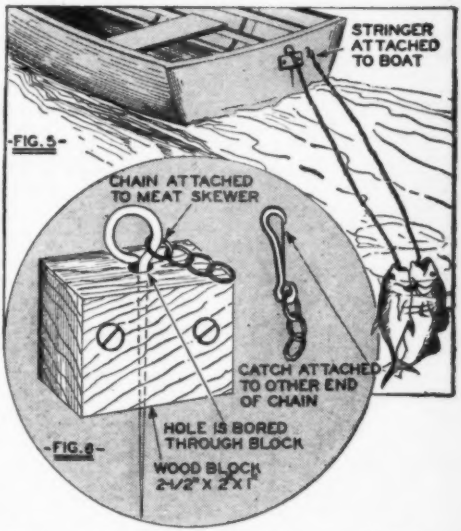
ROWBOAT FISHERMEN

the sleeves should be large enough to be a snug fit when inserted in the female lock. They should be slightly forced and I prefer them as tight as possible even to the extent of being stiff, as rowing the boat will very soon wear them down to a perfect fit. Plenty of grease should be applied to both parts of the lock and you will find to your satisfaction that the annoying rattles and squeaks of loose fitting locks have been entirely eliminated.

A gadget which I have found to be decidedly useful is a fish stringer made from 8 feet of ordinary bath stopper, or window sash weight, chain. (Fig. 5.) To one end of the chain an ordinary meat skewer is attached, the kind that's used to pin rolled meat together, obtained from a butcher shop. The other end of the chain is attached to the outside back of the boat by means of a plain catch, similar to the catch on a dog chain, to a strong staple. About 1-in. from the staple screw, or nail on, a block of wood 2½-in. wide, and 1-in. deep. Through the block bore a hole just large enough to act as a socket, or scabbard, to hold the meat skewer. It is then a simple matter to thread on a fish, over the skewer through the gills, and then insert the skewer in the scabbard. (Fig. 6.) I much prefer this fish stringer method for keeping fish alive rather than the usual rowboat fish box for at the end of my fishing day all that is necessary is to remove the skewer from the socket, unsnap the other end of the chain, and you are off with fresh fish for the frying pan.

For those who like to "Turn fish," that is to say, one fishes while the other rows the boat, the "Utility casting seat" will prove its advantages many times over. The seat is merely a glorified plank just long enough to reach from one side of the rowboat to the other. (Fig. 7.) The length of the plank, or seat, is cut according to the width of the boat and I have found that one 16-in. in width is the most comfortable to sit on. The under part of the seat has two

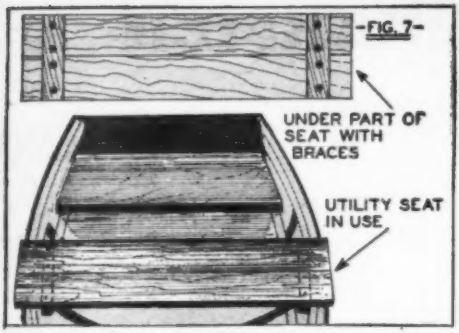


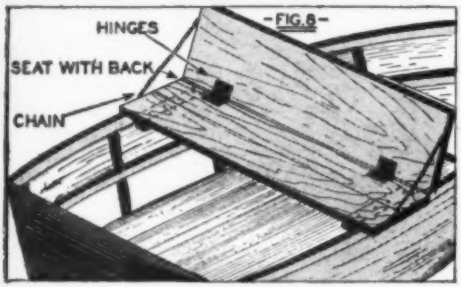

STRINGER ATTACHED TO BOAT
-FIG. 5-
CHAIN ATTACHED TO MEAT SKEWER
CATCH ATTACHED TO OTHER END OF CHAIN
HOLE IS BORED THROUGH BLOCK
-FIG. 6-
WOOD BLOCK 2-1/2" X 2" X 1"

16 by 2-in. braces screwed on so that they will rest against the gunwales of the boat which keep the seat from slipping. By using the "Utility casting seat" a fisherman can sit in the rear of the boat with his back toward the oarsman and cast his plugs, or flies, with very little fear of accidently hooking his companion.

As an added casting suggestion my experiences with snarled lines or lures caught in the open lattice work of the boat floor boards, and many other such annoying things as cracked line enamel, and dirty lines, have taught me a trick which has proved very practical. I never go on a fishing trip where I know that I am going to use a rowboat, that I don't take a piece of white oil cloth 4 by 7 feet. This oil cloth is spread on the bottom of the boat at my casting position and not only does it eliminate the disagreeable annoyances I have mentioned but when evening comes I find it exceedingly less difficult to find the location of my lure thus reducing the hazard of either hooking yourself or a companion. The pure white background of the cloth makes this a comparatively simple matter plus the fact that the cloth is easily washed and cleaned which helps greatly to keep greased lines free from harmful grit and dirt.

No rowboat fisherman is safely complete without ample assurance that he is not going

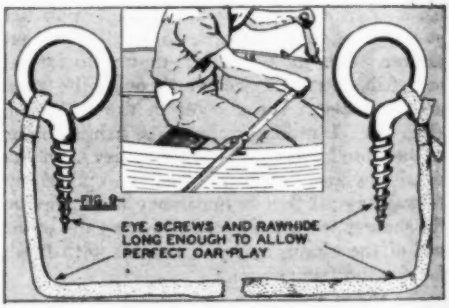




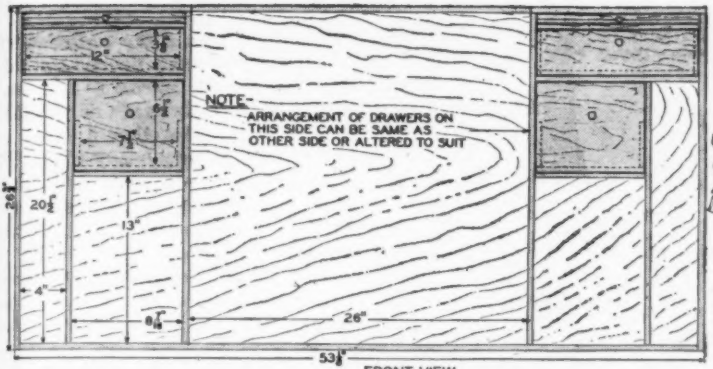
to lose an oar just when the good part of the day's fishing begins. This possibility can be avoided by taking along four medium sized screw eyes and two 10-in. lengths of rawhide (boot laces). Put a screw eye on each of the oars, and a screw eye on the gunwale of each side of the boat. (Fig. 9.) Having securely attached each end of the rawhide length, from a screw eye on the oar to a screw eye on the gunwale leaving plenty of rawhide slack for oar play, you can feel at least a pleasant assurance that your means of navigation will stick with you.

For the live bait fisherman, and especially the worm fisherman, one of the most practical devices is the "Underseat bait pan." (Fig. 10.) An ordinary bread or cookie pan, which you might be able to swipe when the wife isn't looking, is the ideal thing. Attach a handle, of some kind, at the front of the pan, any old handle will do whether it's one from an old pot cover or one from a discarded drawer. On the under side of the rear boat seat screw on two braces for the pan to rest and slide on. The braces should be the same length as the pan and set apart at the same width as the pan. A slight ridge along the inside edges of the braces will be sufficient for the pan to slide on. With this improvised drawer under the back seat of a rowboat it will be a simple matter to slide it in and out when you are in need of a fresh worm or helgramite.

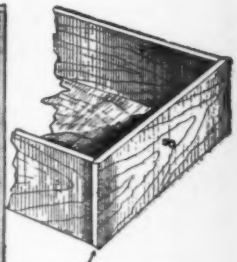
A good sharp pair of cutting pliers is very important. Tote them along as they don't take up much room in your tackle box. Not only will an angler find them a boon companion for various unexpected uses but as a first aid emergency implement they are worth their weight in gold. I once went bass bugging with a friend of mine. Carelessly I let my line hang in loose coils while I changed from one lure to another. Suddenly my companion tripped on the coils and just as neatly as you please the hook of the bass bug imbedded itself in the meaty part of the palm of my hand. To forcibly pull the hook out would have meant a great deal of pain, so deeply was it imbedded, and the barb would have torn the hand badly. Never have I been so grateful for a pair of sharp pliers for with them the operation was simple. I merely pushed the hook through and out, clipped off the hook barb with the pliers, pulled the hook back through, and within an hour, after a generous application of iodine I was none the worse for my unfortunate experience.



A MODERN PLYWOOD DESK

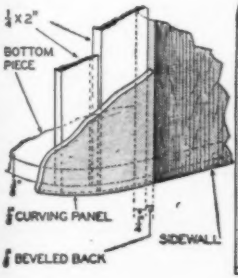


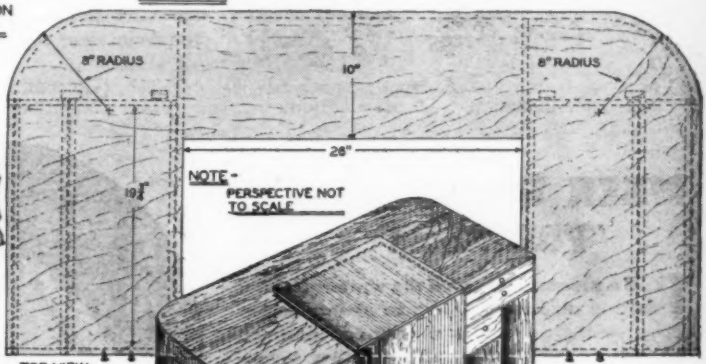
FRONT VIEW



DETAIL OF OUT FLARING FRONT PANELS OF DRAWERS

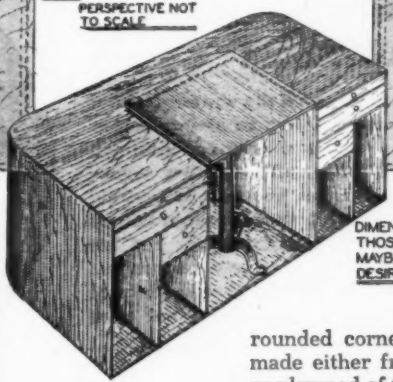
DETAIL SHOWING CONSTRUCTION OF ROUNDED CORNERS



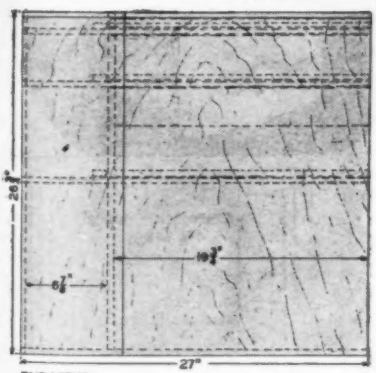


TOP VIEW

NOTE - PERSPECTIVE NOT TO SCALE



DIMENSIONS SHOWN ARE THOSE OF ORIGINAL DESK - MAYBE CHANGED AS DESIRED

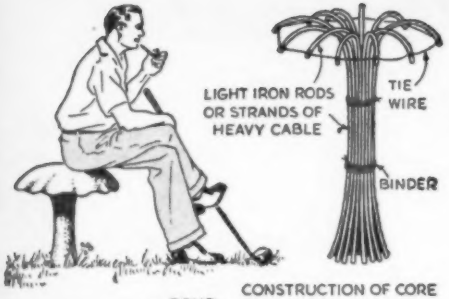


END VIEW

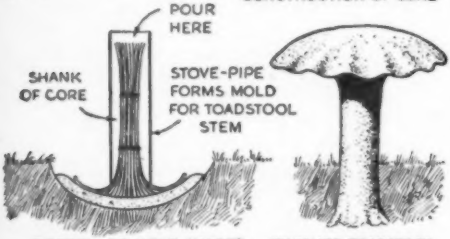
MATERIAL - 3/8" PLYWOOD USED THROUGHOUT
ASSEMBLY - CASEIN GLUE AND 1-1/4" NO. 18 WIRE FINISH NAILS
FINISH - ONE COAT FLAT WHITE, TWO COATS ENAMEL

HERE is a modernistic desk ideally suited to art work. The construction is entirely of inexpensive ⅜" plywood, except the rounded corners. These are made either from ⅛" veneer or plywood of the same thickness. Even linoleum could be used for this purpose although the finish might not be as satisfactory. A light framework is built inside the curve to assure proper contour. All joints are made with casein glue and nails. Dimensions are given in drawing.

The drawers and general design of the side compartments may be varied to serve whatever particular purpose the builder has in mind. As a rule, the arrangement shown has adequate utility as it permits the storage of materials and equipment. The desk may be finished by staining and waxing, or by lacquering. The original desk had a modern blond finish that looked very well.—*Courtland Smith.*



CONSTRUCTION OF CORE



BOTTOM OF HOLE SHAPED LIKE TOP OF TOADSTOOL

FINISHED TOADSTOOL SET IN GROUND

Making Toadstool Garden Seats

DECIDE upon the size of the toadstool top and dig a hole in closely packed soil that diameter. Scoop out the bottom so it is concave, and smooth it off as much as possible.

For the core, bundle together a dozen or more soft iron rods, or very heavy wire. Tie them tightly together with wire and then spread these rods open at one end as shown. The diameter of this top should be about two inches less than the diameter of the hole.

Make a 1 to 3 mixture of Portland Cement; fairly fluid. Pour some in the hole and mold the head of the toadstool two or three inches thick with the wires in the center and equidistant from the edge of the hole. Before this sets hard, lower a suitable length of stove-pipe down over the bundled wires and pour it full of cement.

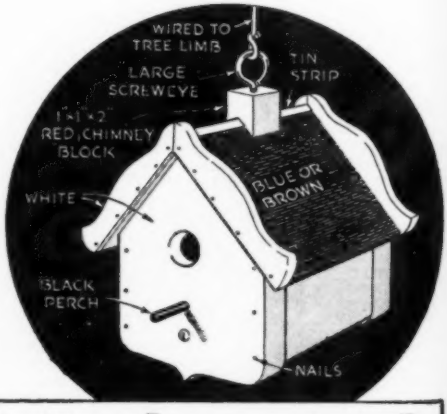
[*Continued on page* 145]

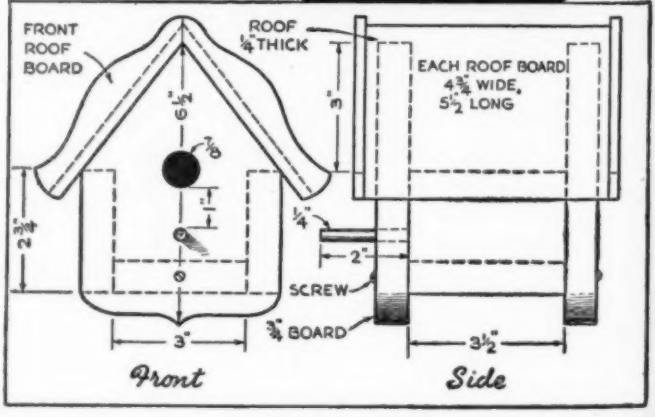
WREN HOUSE "FOR RENT"

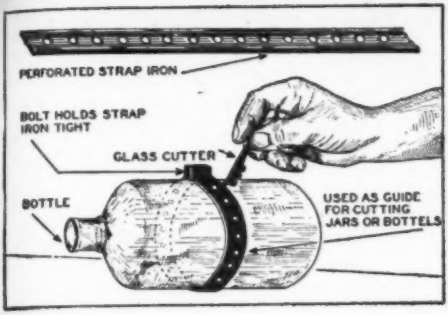
IT IS a pleasure to watch the wrens go about setting up housekeeping in new quarters. They first give the little house a thorough inspection and, feeling satisfied, they vigorously set about building the nest, chattering and singing. Make two or three wren houses this spring, and have them ready for the songsters. Wrens seldom occupy a house two years in succession, so you should have at least two houses swinging from limb of trees near the window where you can watch them.

A common wood packing box will furnish you with enough material for several wren houses. From a board ¾" thick saw out the front and back pieces as shown in the Front View. These boards are 4½" wide, 6½" high overall. Run a line vertically, dividing the board in half, and from the top center run two lines to the sides to form the angle for the

[*Continued on page* 144]







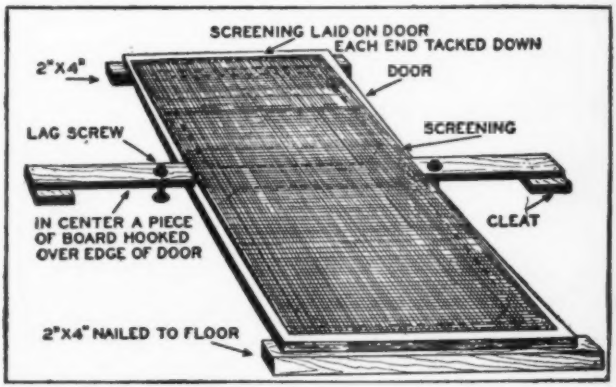
A Handy Bottle Cutter

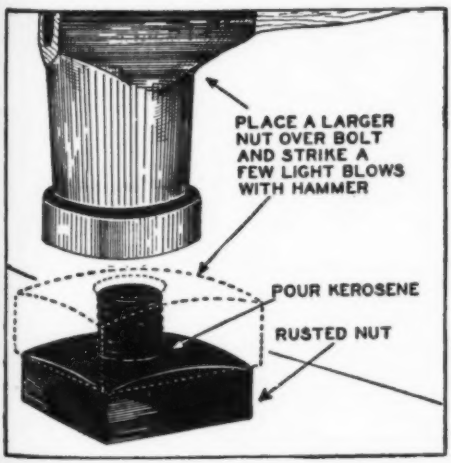
METAL straps such as used by plumbers in hanging pipe from floor beams are very useful as aids in glass cutting on bottles and jars. Holes, spaced regularly along the straps, enable the user to adapt a single piece of it to a great many different size jars and bottles. Since the strap can be tightened with a nut and bolt through the proper holes it may be used as a guide for the glass cutter to run against. This makes it possible to do a considerably better job as the cut can be made with greater pressure in this manner. Snapping the bottle or jar in two is then less likely to leave jagged irregularities along the edges to be ground off. Strap metal of this sort is obtainable through any plumbing or building supply house. This same method can be applied to the cutting of large glass tubes in the laboratory, often a ticklish job.—*A. H. W.*

A Tight Screening Job

THE almost impossible job of stretching screening tight on a door is simple when the following stunt is used. As shown in the picture, the ends of the door were raised from the floor about two inches by being placed on layers of boards. A two by four, if available, is even better. These are tacked to the floor to keep them in position. Then at the halfway mark pieces of board are hooked over the edges of the door, keeping them close to the edges so they will not interfere with putting on the wire. Boards under the ends of these were about the thickness of the door. Next to the door the ends are fastened to the floor with lag screws. The lag screws are tightened down until the door nearly touches the floor, care being

[*Continued on page* 145]



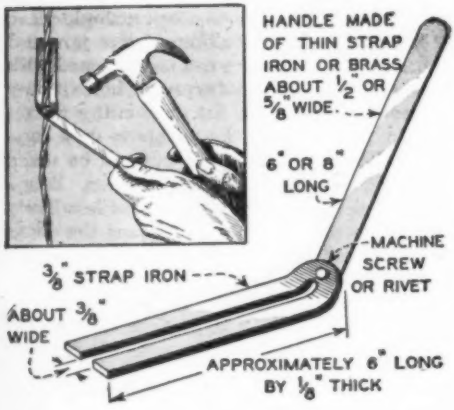


Removing Rusty Nuts

IN A great many types of machinery, particularly those in marine use or subject to exposure, nuts frequently become rusted onto their bolts in such a way that their removal is extremely difficult. Often, in attempting to remove a nut where this condition exists, further inconvenience is encountered due to breakage of the bolt. In some cases when this occurs it is almost impossible to remove the broken bolt for replacement. A simple way to overcome this difficulty is shown in the accompanying drawing. A nut intended for a larger bolt than the one that is rusted, is placed on top of the "frozen" nut. Then kerosene is poured on them. A few sharp taps with a hammer on the larger nut will usually serve to loosen the smaller one.

Workshop Aids From Odds And Ends

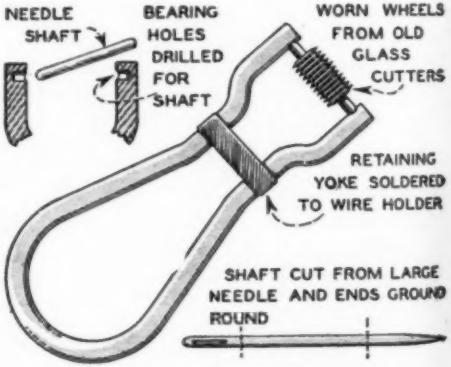
Staple Gauge Protects Cord When Hammering

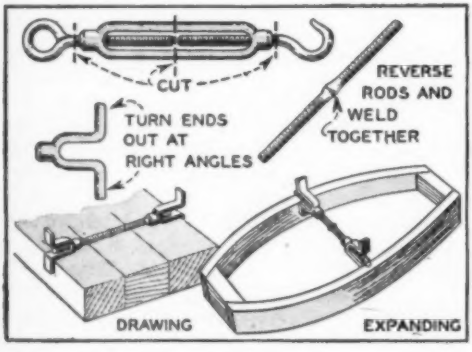

HANDLE MADE OF THIN STRAP IRON OR BRASS ABOUT ½" OR ⅝" WIDE.
6" OR 8" LONG
MACHINE SCREW OR RIVET
⅜" STRAP IRON
ABOUT ⅜" WIDE
APPROXIMATELY 6" LONG BY ⅛" THICK

THE insulated staples or double pointed tacks used to fasten lamp or fixture cord to walls or ceilings are sometimes driven in too tightly, squeezing the insulation so hard that a short circuit might develop, or even a break in the wire. If the staple is not driven in far enough the result is unsightly as the cord will sag between the supporting tacks. A handled gauge such as shown in the illustration will prove valuable while doing work of this nature as it insures uniformity in driving the staples to just the right depth to hold the cord firmly without danger of injury. Form the gauge from a piece of iron strip, 12" long, ⅜" wide and ⅛" thick. This thickness depends on the size of cord to be handled but that specified is correct for ordinary No. 14 twisted cord. Bend up the looped end so that it clears the cord when the gauge is applied over it. Fasten the handle on with a machine screw so that you can set it at an angle when wiring close to a corner. To use the gauge just start the staple over the wire, apply the gauge with the staple in the slot, and drive the staple home. The gauge will stop the tack at the correct depth.—*W. C. W.*

Inexpensive Tool For Dressing Emery Wheel

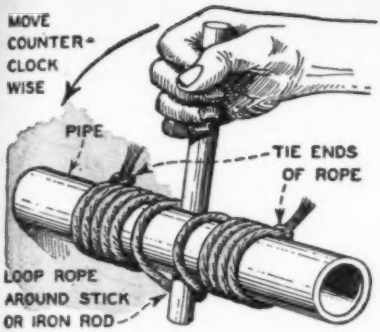
A REGULAR sized dressing tool is usually too large and clumsy to use efficiently on small and narrow wheels. A tool to more nearly agree with the size of these small wheels can be easily made from a number of dulled glass cutter wheels. Enough of them to reach across the grinding wheel are assembled on a length of needle steel loosely enough so that they can turn freely. This steel shaft is then mounted in a stiff wire holder as shown in the detail. The hard steel cutters will quickly bring a small wheel back to a true circle and give its face a new set of abrasive points.—*W. C. W.*


NEEDLE SHAFT
BEARING HOLES DRILLED FOR SHAFT
WORN WHEELS FROM OLD GLASS CUTTERS
RETAINING YOKE SOLDERED TO WIRE HOLDER
SHAFT CUT FROM LARGE NEEDLE AND ENDS GROUND ROUND



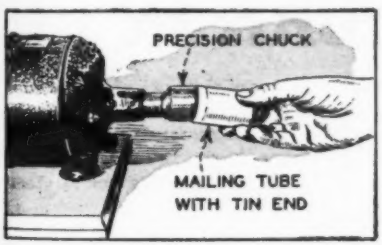
Clamps From Turnbuckles

OLD turnbuckles can be made into extremely useful clamps as shown in the drawing. The turnbuckle body is first sawed in half as shown, and then heated and bent to the position indicated. The threaded rods are removed and welded together at the hook ends. The bent halves of the body are screwed on the ends of the welded screws to form the clamp. These clamps can be used either for expansion or contraction.—*W. C. W.*



Strong Pipe Wrench

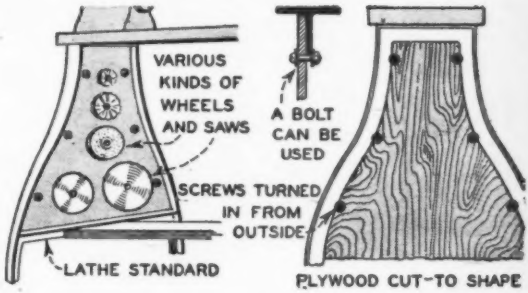
A GOOD substitute for a pipe wrench can be made with a piece of strong rope and a stick or an iron bar. Tie the ends of the rope about a foot apart around the pipe that is to be loosened. Then roll the rope around the pipe, leaving a loop in the center for the lever, or stick, to pass through. You can remove any pipe that you can get to in this way. Although the ends of the rope should not be much more than a foot apart, a number of turns are necessary for a grip.—*F. C.*



A Chuck Dirt-Guard

IN A shop where wood working is done or in a basement layout located near the furnace, the threading on a precision chuck becomes covered with wood or coal dust and this causes more or less abrasion when the chuck is used. Finally the chuck may become wobbly on its mandrel due directly to the gradual cutting of the dust. A sheath composed of a cardboard mailing tube having a tin bottom makes a good protective cover for a chuck.—*W. C. W.*

Lathe Ends Make Handy Tool Racks



THERE is considerable space at each end of the cast iron lathe stands which can be utilized in the manner one shop owner used. This stunt consisted of cutting ⅝-inch plywood of a size and shape which would just fit within the frame between the top supporting the lathe, and the spreader just off the floor. This was held in each end by screws turned tight against the frame—see the detail—from the outside of each end. Several of these screws spaced at random, hold the plywood rigid. Inside the ends then are pegs, hooks and other types of supports to hold circular saw blades, buffing wheels, etc. If no structural member of the lathe stand crosses under the bed, it is a simple matter to add a shelf or two between the ends, supporting them in the center if necessary.—*D. V. H.*

A Punch From A Hoe Tip

A HOLLOW punch can be made from the ferrule on the end of an old hoe or rake with the aid of a few ordinary shop tools. The taper of the ferrule enables the shop worker to adapt the finished diameter of the cutting edge to a wide variety of uses. To make a small diameter hole, the ferrule is cut off close to the small end. If a larger hole is desired, the cut is made nearer the large end. The usefulness of the ferrule for this purpose is in no way impaired by rust, as the outer surface is ground away in the sharpening process.—*A. H. W.*

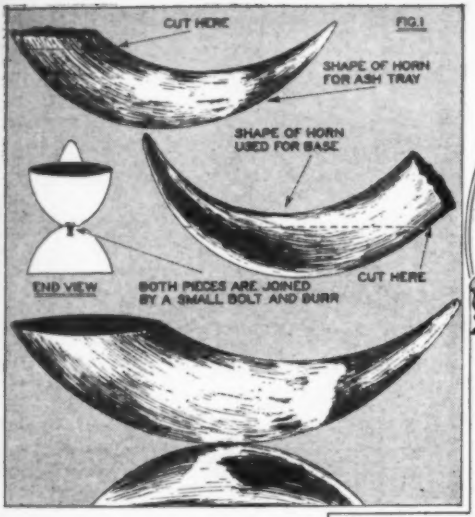


FIG. 1
CUT HERE
SHAPE OF HORN FOR ASH TRAY
SHAPE OF HORN USED FOR BASE
END VIEW
BOTH PIECES ARE JOINED BY A SMALL BOLT AND BURR
CUT HERE

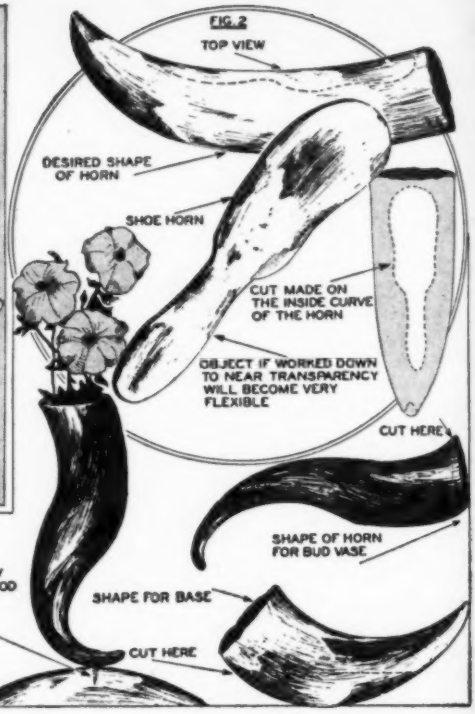


FIG. 2
TOP VIEW
DESIRED SHAPE OF HORN
SHOE HORN
CUT MADE ON THE INSIDE CURVE OF THE HORN
OBJECT IF WORKED DOWN TO NEAR TRANSPARENCY WILL BECOME VERY FLEXIBLE
CUT HERE
SHAPE OF HORN FOR BUD VASE
SHAPE FOR BASE
CUT HERE

HORN IN ON

FOR centuries past cattle horns and horns of various other animals have been important to mankind. They have been used as a material in the home, on the hunt, in battle and for ornaments. Drinking horns, or cups, powder horns, spoons, hunting horns and battle horns, tips for arrows and bows and ornaments for clothing were commonplace. Such use of the horn now is quite rare.

In fact and fancy we also come into contact with the use of the horn. Robin Hood and his merry men in the forests of Sherwood used the horn as a means of signaling to each other. The early pioneer of the West used a horn to keep his powder dry. They used the horn for dishes, getting their idea from the natives who preceded them in the frontier lands. Even in the Bible, there is mention of the horn. The use of the horn can be traced back to time immemorial.

Modern developments in industry and inventions have replaced the horn with glass, metals, plastics and other suitable substitutes. But as a handicraft-hobby, working with horn is as fascinating today as ever.

The natural form of the horn makes it necessary for the worker to adapt his design to the material at hand. It is almost impossible to make two objects exactly alike. This enhances development of individual ability, appreciation of the importance of good design, use of tools, and an understanding of the obstacles and accomplishments of horn users of centuries past.

Horncraft is not an expensive hobby and very few special tools are needed. In many boys' camps, horncraft has superseded other activities in handicraft classes.

A 100-pound sack of horns of assorted shapes and sizes can be obtained from a packing company or stockyards for $4.50 to $5.00. It will furnish sufficient material for 75 to 100 individual projects. By buying them in bulk, individuals can get smaller horns at around 5 cents each and larger ones for 10 cents. Colored horns are the most sought after, but often horns which seem almost colorless can be worked down to bring out hidden color designs and values. The most beautiful combinations are black on white, or red on white.

The general procedure for preparing and finishing a "horn project" is as follows:

Select a horn of the shape desired, considering color, length and depth of curve. Then shave the rough surface and dirt off

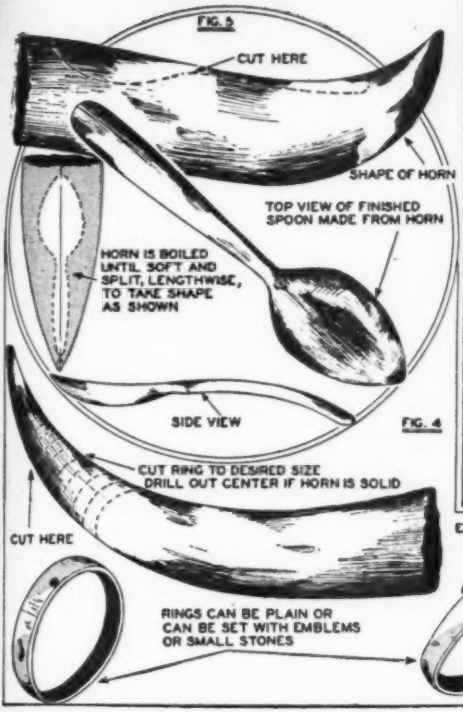


FIG. 5
CUT HERE
SHAPE OF HORN
TOP VIEW OF FINISHED SPOON MADE FROM HORN
HORN IS BOILED UNTIL SOFT AND SPLIT, LENGTHWISE, TO TAKE SHAPE AS SHOWN
SIDE VIEW
FIG. 4
CUT RING TO DESIRED SIZE
DRILL OUT CENTER IF HORN IS SOLID
CUT HERE
EMBLEM GLUED ON
RINGS CAN BE PLAIN OR CAN BE SET WITH EMBLEMS OR SMALL STONES

SHAPE OF HORN TO BE CUT
CUT HERE
FIG. 6
SIDE VIEW OF NECKERCHIEF SLIDE AFTER BEING CUT FROM HORN
POSITION OF SLIDE
FRONT VIEW
VARIOUS ORIGINAL DESIGNS CAN BE WORKED IN ON THE SURFACE OF THE SLIDE

HORNCRAFT

with a knife, or cutting tool. (A sharp edged piece of glass or tin will do.) After this scrape the surface with a glass edge, or knife, (grainward) to remove scars, scratches, and dents. Wipe the surface with a soft cloth to remove the scrapings and accumulated dust. Next, sandpaper the horn with a fine grade of sandpaper and cut out the desired shape roughly with a saw (crosscut or scroll), according to design previously sketched with a pencil. Complete by working down the cut edges with a knife or sandpaper until they are smooth.

To bring out the color in a horn and to work it to extreme smoothness, polish or rub the horn with any material having a soap or oil base. Ordinary soap, all light oils, shoe polish, shaving soap, or tooth paste will do. Assembling the finished object and screwing it together is the last process. The high polish given by the oil rubbing can be maintained by covering the object with a thin coat of clear gloss varnish. This procedure will give the finished product an appearance quite equal to any similar commercially made object. The total cost of any small finished object will not exceed 10 to 15 cents.

To make a spoon (Fig. 5) or object which requires a shape that differs from the shape of the natural horn, the horn should be boiled in water until it becomes soft and pliable. Then the horn should be split lengthwise and pressed flat. Next cut the object roughly, mold it into suitable shape, and allow to cool. The finishing of the cutting, polishing and scraping can be done after the cooling process is complete. (Do not bend the horn when cooling. This will cause a break or crack.)

Numerous objects aside from those shown in the drawings can be made from the lowly cow horn. Buffalo horns, though often difficult to obtain, finish nicely as they are jet black.

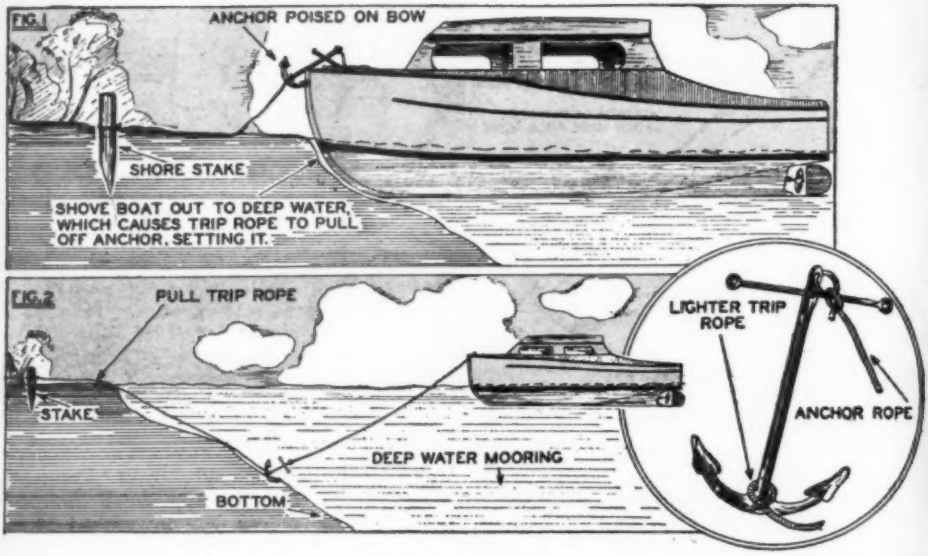
The ash tray shown in Fig. 1 is a very simple project although it requires two horns. Each horn is prepared as previously described and then finished and assembled. The two sections are joined with a small bolt which may either be fastened with a nut or burred.

The flower vase in Fig. 3 is a somewhat similar design, using one horn for the body and another for the base. A careful choice of the body horn will add considerably to the beauty of the finished job.

The shoe horn in Fig. 2 requires only one

[*Continued on page 145*]

HELPFUL HINTS FOR

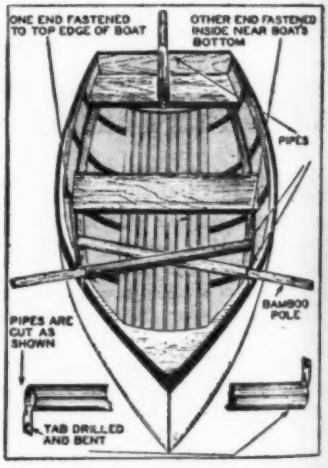


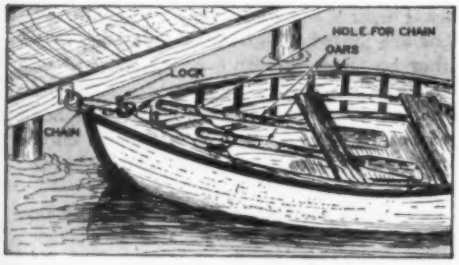
Deep Water Mooring Without Dinghy

IN LOCATIONS where the prevailing wind is generally in the proper direction, a dinghy may be dispensed with by the method illustrated. The anchor is poised on the fore deck when the boat is landed, with the mooring rope coiled. When the boat is pushed out, the anchor is dropped with the trip rope. It can be lifted likewise.—*B. M.*

Pipes Hold Poles For Trolling

THIN walled pipe, cut and mounted as shown, enables one person to row a boat and use three lines and poles for trolling at the same time. The two front poles may have a span of about 25 feet. The tabs at the ends of the pole-pipes are drilled to take a single screw each with which they are secured to the boat. The diameter of the pipes used should be sufficiently large to accommodate all average poles.—*D. V. H.*

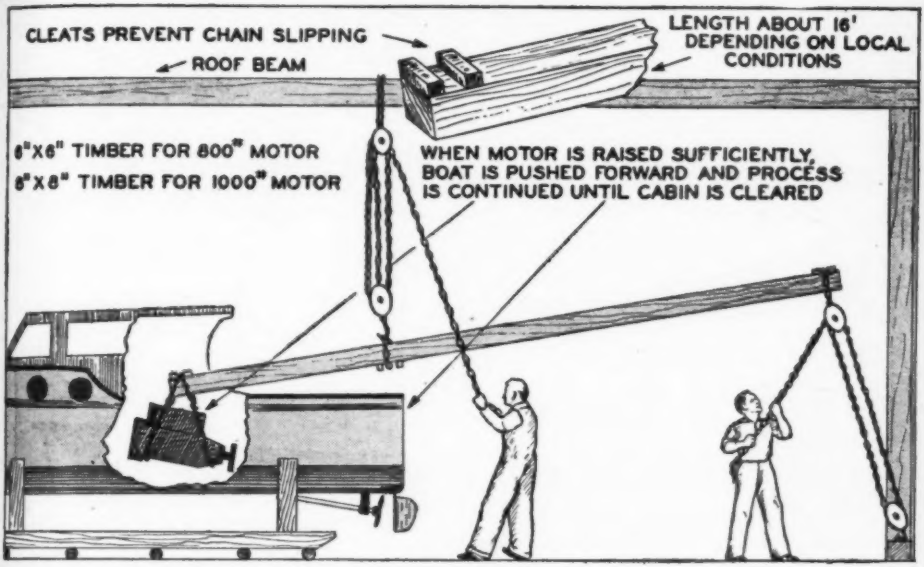

ONE END FASTENED TO TOP EDGE OF BOAT
OTHER END FASTENED INSIDE NEAR BOAT'S BOTTOM
PIPES
BAMBOO POLE
PIPES ARE CUT AS SHOWN
TAB DRILLED AND BENT

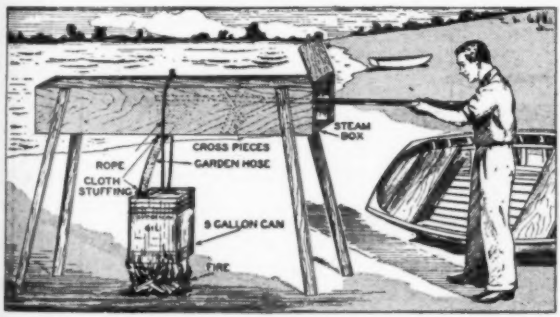


A Theft-Proof Oar Chain

AN EASY way to protect oars from thieves is shown at the left. A hole is drilled through the butt of each oar as shown. A chain is passed through these holes, attached to the mooring ring, and padlocked. A rust-proof padlock must be used for the chain, however, as any other type would quickly be rendered useless by spray and cause considerable inconvenience.—*B. B.*

AMATEUR SAILORS


CLEATS PREVENT CHAIN SLIPPING
ROOF BEAM
LENGTH ABOUT 16' DEPENDING ON LOCAL CONDITIONS
6"X6" TIMBER FOR 800# MOTOR
6"X8" TIMBER FOR 1000# MOTOR
WHEN MOTOR IS RAISED SUFFICIENTLY, BOAT IS PUSHED FORWARD AND PROCESS IS CONTINUED UNTIL CABIN IS CLEARED



Lifting Motor Out Of Cabin

THE difficulty of removing the motor from a boat with a large cabin overhang is easily overcome with a lever beam. The beam can be manipulated from either end with pulleys, the boat being moved when clear. Sketch above shows details.—*H. S.*

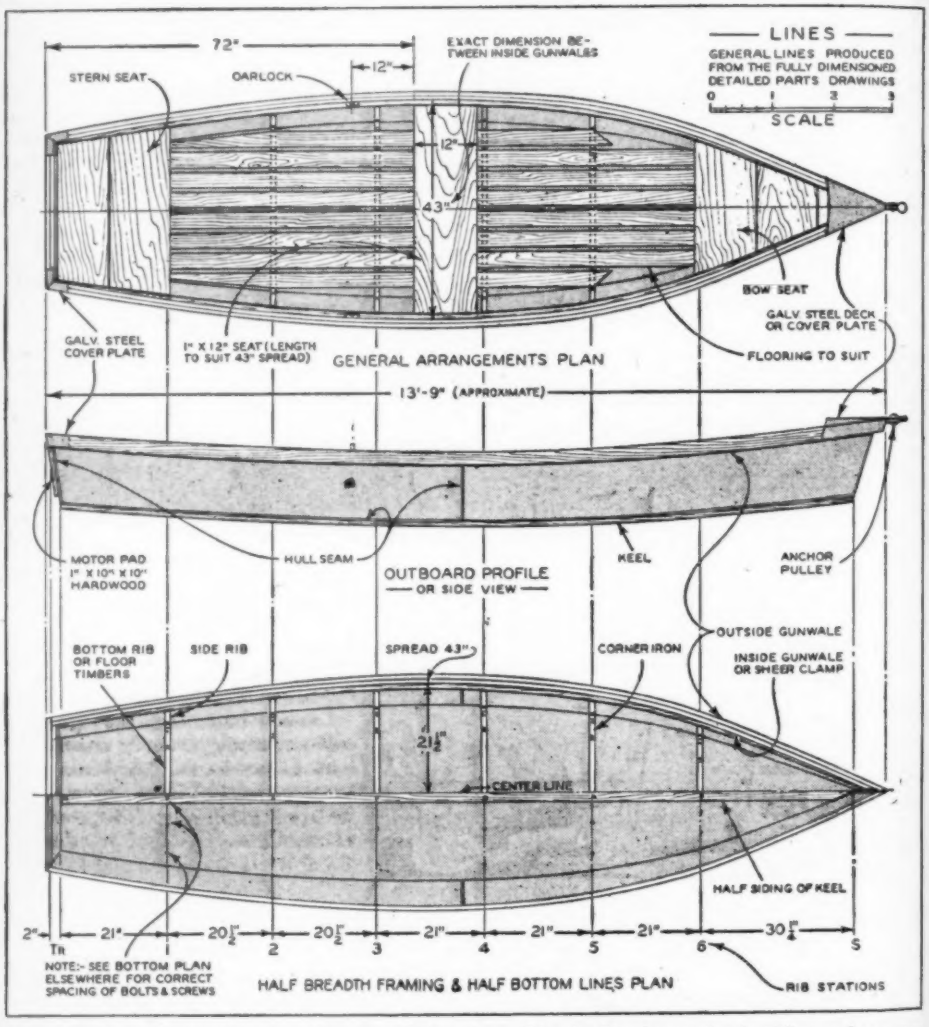
A Simple Steam Box

AN EFFICIENT steam box can be made from an old oil can and a length of ordinary garden hose as shown. The box, itself, is of the usual wood construction. Leather hinges at the top of the end door are best. The can is suspended by a rope.—*B. M.*

Rope Skids For Boat

WHEN a small boat is frequently moved over a rough dock or landing, the finish on the bottom may be protected by a length of rope. The rope is passed under the oars as indicated in the drawing, and trailed under the transom, the ends dragging under the boat. The rope can be kept in the boat where it will always be handy.—*G. E. H.*

BUILD "ZINKY DINK"



Approximate dimensions are given above. The exact widths and overall length will vary somewhat depending on the accuracy with which the parts are laid out, cut, fitted and joined. This boat is an ideal fishing skiff because of its strength, lightness and roominess. A light outboard motor will kick it along at a good pace, and a convenient anchor pulley is provided at the bow.

EASE of handling and absolute safety probably top the list of a dozen or more reasons for the steady increase in popularity of the steel boat. Each year finds them in increasing numbers on inland lakes and streams, in use by fishermen and hunters and by just plain citizens who want the enjoyment of easy oaring or extra swiftness of outboard-motoring. It relieves the mind and makes boating more enjoyable to know that built-in air chambers make the steel boat unsinkable.

In the past, plans for construction of a tested steel boat have either been retained as a trade secret by the manufacturers, or, what is more likely, construction has appeared too

A 14-FT. STEEL SKIFF

As easy to build as a wooden rowboat, this galvanized steel skiff is unsinkable and will give years of economical service. Cost of materials is very low, and only ordinary hand tools are required.

by Ken Murray

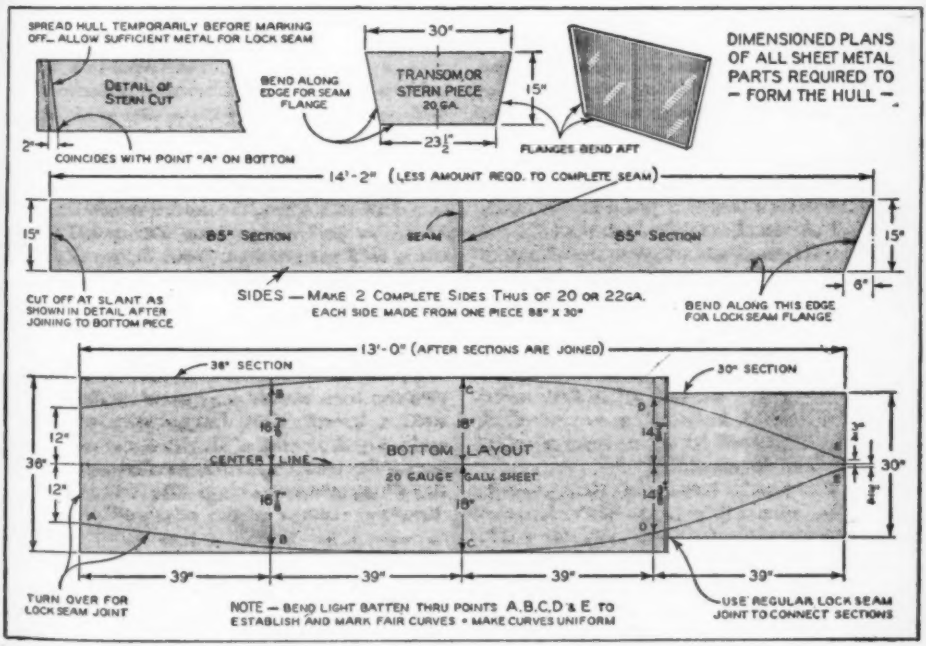
difficult to be attempted by most amateur builders. Actually, the assembling of a steel job is no more complicated than following the designs of many of the small wood boats.

Two sheets of galvanized steel, one 36x120-in., the other 40x30-in., are needed for the bottom. These are securely lock-seamed together to make one sheet 13-ft. long; the edges may be tinned beforehand, if you wish, to make it slightly easier to solder up the finished hull.

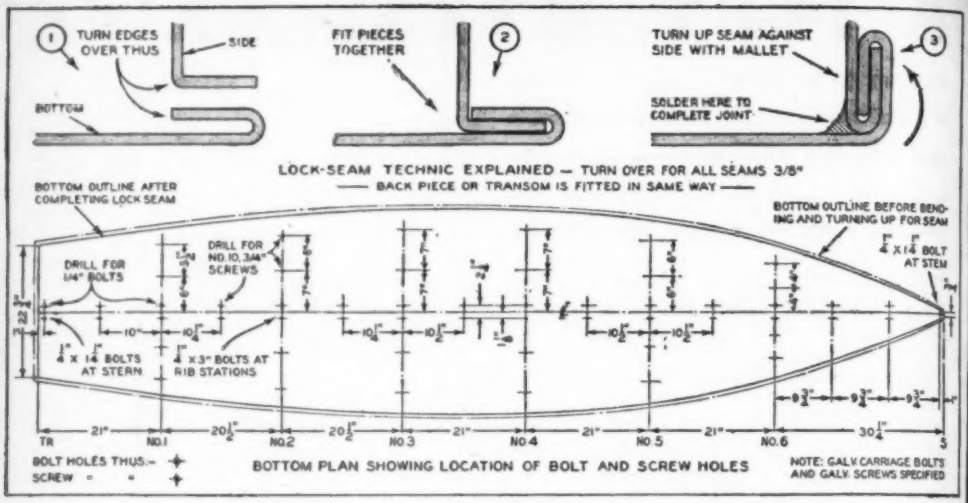
Lay the sheet on the floor and outline the bottom of the boat with a fine pencil. The use of a greasy marking pencil would interfere when it came time to solder. A flexible wood batten is an aid in laying out accurate curves. Heavy tin shears will be required to cut the bottom from the sheet, after which the edges are turned up ⅜-in. all around in order to lock-seam it to the sides. The plans allow for a ⅜-in. turn-up on all seams; this can be accomplished with heavy, long-handled pliers, taking pains to see that each bite is uniform. If time is a matter of importance, the special seaming and bending tools of a near-by tinsmith will be a considerable aid and their use should not add much to the cost of the boat.

Lay a piece of heavier sheet steel (or two or three thicknesses of the 20-gauge galvanized steel) against the turned-up edges, on the inside, and with a heavy hammer pound the edges over.

To make the sides you will need two 7-ft. 1-in.x30-in. galvanized sheets, each of which is cut in half lengthwise to make one side. Join the side pieces by cutting both with a 6-in. bevel at one end, which will be the front,


SPREAD HULL TEMPORARILY BEFORE MARKING OFF— ALLOW SUFFICIENT METAL FOR LOCK SEAM
DETAIL OF STERN CUT
2"
COINCIDES WITH POINT "A" ON BOTTOM
BEND ALONG EDGE FOR SEAM FLANGE
30"
TRANSOM OR STERN PIECE 20 GA.
15"
23½"
FLANGES BEND AFT
DIMENSIONED PLANS OF ALL SHEET METAL PARTS REQUIRED TO — FORM THE HULL —
14'-2" (LESS AMOUNT REQD. TO COMPLETE SEAM)
15"
85" SECTION
SEAM
85" SECTION
15"
6"
CUT OFF AT SLANT AS SHOWN IN DETAIL AFTER JOINING TO BOTTOM PIECE
SIDES — MAKE 2 COMPLETE SIDES THUS OF 20 OR 22GA.
EACH SIDE MADE FROM ONE PIECE 88" X 30"
BEND ALONG THIS EDGE FOR LOCK SEAM FLANGE
13'-0" (AFTER SECTIONS ARE JOINED)
38" SECTION
30" SECTION
12"
36"
12"
CENTER LINE
BOTTOM LAYOUT
20 GAUGE GALV. SHEET
30"
39"
39"
39"
39"
TURN OVER FOR LOCK SEAM JOINT
NOTE — BEND LIGHT BATTEN THRU POINTS A,B,C,D & E TO ESTABLISH AND MARK FAIR CURVES • MAKE CURVES UNIFORM
USE REGULAR LOCK SEAM JOINT TO CONNECT SECTIONS

Draw the parts of the boat carefully on the sheet metal with a lead pencil (do not use grease pencil), then cut out with a heavy pair of shears. Edges are then bent over where indicated to form the lock seams.


1 TURN EDGES OVER THUS
SIDE
BOTTOM
FIT PIECES TOGETHER
2
TURN UP SEAM AGAINST SIDE WITH MALLET
3
SOLDER HERE TO COMPLETE JOINT
LOCK-SEAM TECHNIC EXPLAINED — TURN OVER FOR ALL SEAMS 3/8"
BACK PIECE OR TRANSOM IS FITTED IN SAME WAY
BOTTOM OUTLINE AFTER COMPLETING LOCK SEAM
BOTTOM OUTLINE BEFORE BENDING AND TURNING UP FOR SEAM
DRILL FOR 1/4" BOLTS
DRILL FOR NO.10, 3/4" SCREWS
1/4" X 14" BOLT AT STEM
1" 4 X 14 BOLTS AT STERN
4" X 3" BOLTS AT RIB STATIONS
TR
NO.1
NO.2
NO.3
NO.4
NO.5
NO.6
S
BOLT HOLES THUS:-
SCREW
BOTTOM PLAN SHOWING LOCATION OF BOLT AND SCREW HOLES
NOTE: GALV. CARRIAGE BOLTS AND GALV. SCREWS SPECIFIED

Drawings 1, 2 and 3 at top show the method of forming the lock seams. If desired, the seams can be soldered on the outsides as well as the insides, though this is not strictly necessary.

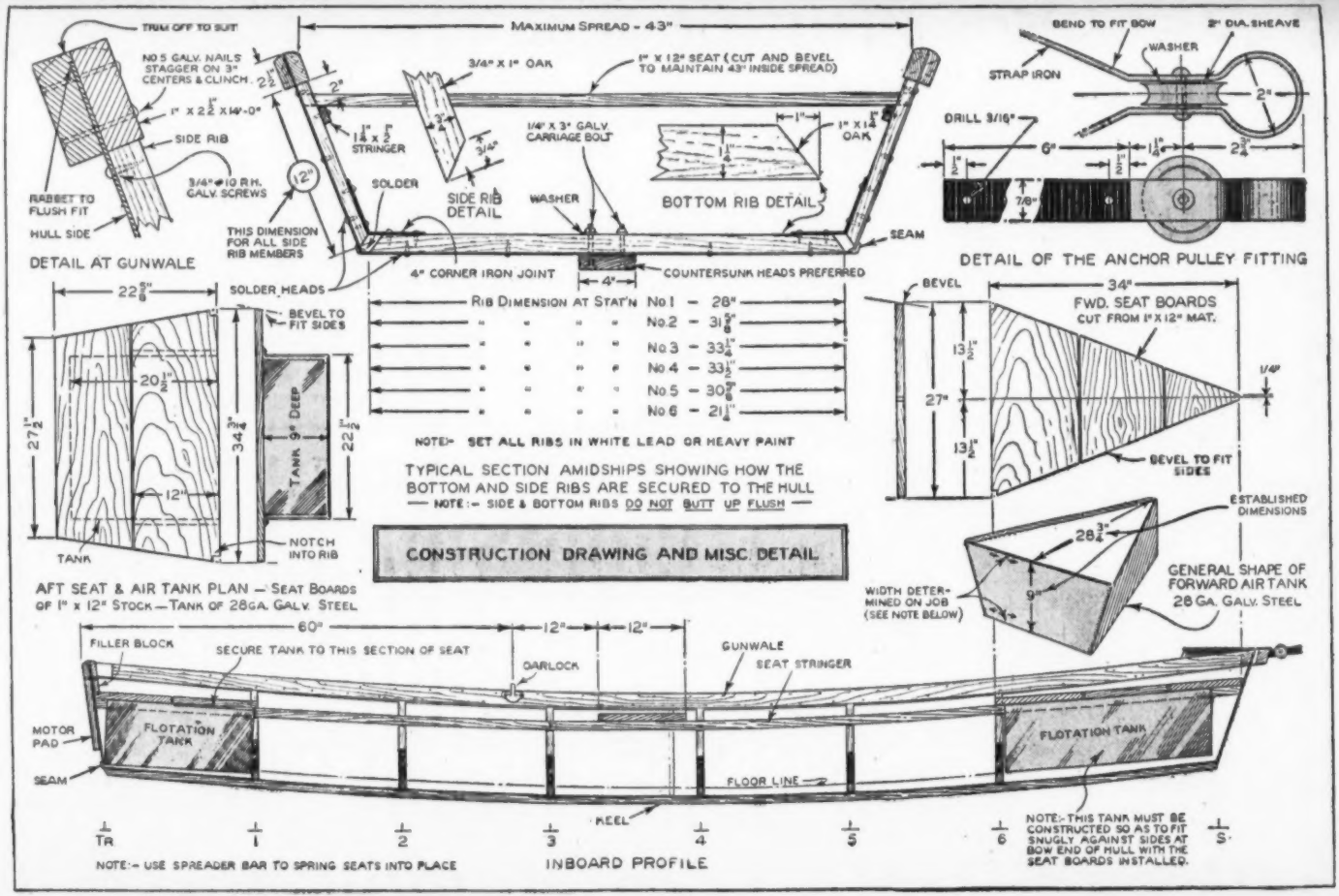
then lock-seam the edges together. With the aid of an assistant, fold the sides over, then turn over the bottom edges in order to fit them and make a lock-seam with the edges of the bottom. After the sides are well fitted to the bottom you can tighten the seam and turn it over against the sides with a mallet, as depicted in one of the drawings, and the hull will be solid enough for the succeeding operations. The back piece is fitted in place in the same manner; after setting it at the desired slant, cut away excess metal of the sides and lock-seam the back in place.

You will notice that the gunwale and other parts are of wood, which does not detract from the safety and other features of the steel hull but simplifies construction to some degree. The pine gunwale strips should be given a shallow rabbet, as one of the drawings indicates, to accommodate the thickness of the sides of the hull. Such wood parts should be painted on the sides that make contact with metal, before they are attached. Unfinished sides will be taken care of when the entire boat is painted.

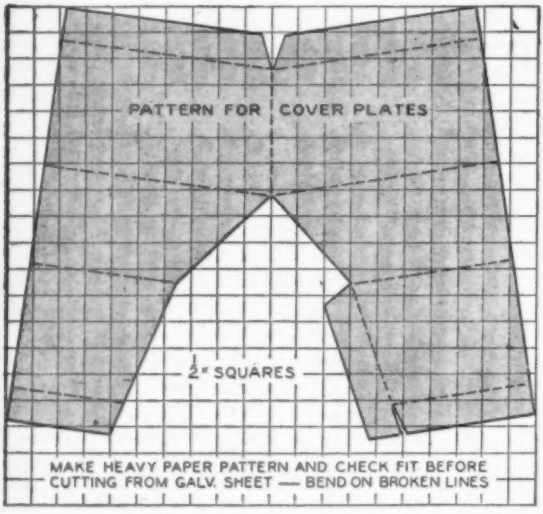
Bevel the inside boards of the gunwale about 1-in., where they meet at the front of the boat. Fasten the gunwale to the hull with a clamp at this point and cut off the other end so that it will fit the end of the boat. Use another clamp to hold the gunwale to the hull about three feet from the bow, then nail it securely in place. For this you will need a heavy hammer and an iron block. Use No. 5 galvanized nails, driving them from inside the hull and clinching them on the outside with the iron block. The nails should be staggered and about 3-in. apart. Move the clamps as the nailing progresses. After the gunwale is fastened to the stern, saw off the outside pieces even with the back.

Soldering of the hull may be done at this time, if not previously, and requires a heavy soldering copper. Experience indicates that ordinary bar solder with a non-acid flux is best, and that all of the soldering be done from the inside, so as to fill the lock-seams. In case there is any damage to the hull, such as a dent at a seam, the solder would be more likely to pull away from the outside than when soldering is done from the inside. Reheat the iron immediately it starts to cool, as the solder should flow very freely in order to do a perfect, long-lasting job.

The next operation consists in marking out the position of the oak ribs, and before doing this the boat should be spread at the middle with a board 43-in. long. The method of widening the waist of the boat so as to easily insert the wood spreader is shown in one of the illustrations on page 115. The lines indicating position of the ribs will guide you in accurately drilling screw and bolt holes through the steel hull. Center a rib on one of the marks, and if you are working alone, hold it down against the bottom of the boat with a weight such as the nail-clinching iron. You can reach underneath and mark the rib with a pencil, through the holes. After all of the bottom ribs are marked, drill them to


TRIM OFF TO SUIT
NO 5 GALV. NAILS STAGGER ON 3" CENTERS & CLINCH.
1" X 2½" X 14'-0"
SIDE RIB
3/4" @ 10 R.H. GALV. SCREWS
RABBET TO FLUSH FIT
HULL SIDE
DETAIL AT GUNWALE
MAXIMUM SPREAD - 43"
3/4" X 1" OAK
1" X 12" SEAT (CUT AND BEVEL TO MAINTAIN 43" INSIDE SPREAD)
1¼ X ½ STRINGER
SIDE RIB DETAIL
1/4" X 3" GALV. CARRIAGE BOLT
1" X 1¼ OAK
BOTTOM RIB DETAIL
SOLDER
WASHER
SEAM
THIS DIMENSION FOR ALL SIDE RIB MEMBERS
4" CORNER IRON JOINT
4"
COUNTERSUNK HEADS PREFERRED
SOLDER HEADS
BEVEL TO FIT SIDES
TANK 9" DEEP
NOTCH INTO RIB
TANK
AFT SEAT & AIR TANK PLAN — SEAT BOARDS OF 1" x 12" STOCK — TANK OF 28GA. GALV. STEEL
RIB DIMENSION AT STA'N
No 1 - 28"
No 2 - 31 5/8"
No 3 - 33 1/4"
No 4 - 33 1/2"
No 5 - 30 5/8"
No 6 - 21 1/4"
NOTE:- SET ALL RIBS IN WHITE LEAD OR HEAVY PAINT
TYPICAL SECTION AMIDSHIPS SHOWING HOW THE BOTTOM AND SIDE RIBS ARE SECURED TO THE HULL
— NOTE:- SIDE & BOTTOM RIBS DO NOT BUTT UP FLUSH —
CONSTRUCTION DRAWING AND MISC. DETAIL
BEND TO FIT BOW
2" DIA. SHEAVE
WASHER
STRAP IRON
DRILL 3/16"
DETAIL OF THE ANCHOR PULLEY FITTING
BEVEL
34"
FWD. SEAT BOARDS CUT FROM 1" X 12" MAT.
27"
BEVEL TO FIT SIDES
ESTABLISHED DIMENSIONS
WIDTH DETERMINED ON JOB (SEE NOTE BELOW)
GENERAL SHAPE OF FORWARD AIR TANK 28 GA. GALV. STEEL
60"
12"
12"
FILLER BLOCK
SECURE TANK TO THIS SECTION OF SEAT
CARLOCK
GUNWALE
SEAT STRINGER
MOTOR PAD
FLOTATION TANK
SEAM
FLOOR LINE
KEEL
FLOTATION TANK
TR
1
2
3
4
5
6
S
NOTE:- USE SPREADER BAR TO SPRING SEATS INTO PLACE
INBOARD PROFILE
NOTE:- THIS TANK MUST BE CONSTRUCTED SO AS TO FIT SNUGLY AGAINST SIDES AT BOW END OF HULL WITH THE SEAT BOARDS INSTALLED.

PHOTOS SHOW VARIOUS STEPS


PATTERN FOR COVER PLATES
2" SQUARES
MAKE HEAVY PAPER PATTERN AND CHECK FIT BEFORE CUTTING FROM GALV. SHEET — BEND ON BROKEN LINES

Be sure to make paper patterns for the corner plates for exact fit before cutting any metal.

a depth of ½ or ¾-in. to avoid splitting by the screws. At the marks for keel bolts, drill ¼-in. holes, then fasten the bottom ribs in place with No. 10 screws ¾-in. long.

The spreader may now be removed in order to install the side ribs. To line them up with the bottom ribs, use a square. Join ends of side and bottom ribs with 4-in. galvanized steel corner braces, which must be spread to a greater angle. Strips of ready-cut window or door rail, the former measuring ½ by 1¼-in. and the latter somewhat wider, serve as pole rails. The pine or oak keel is attached with 3-in.x¼-in. galvanized carriage bolts, with the heads outside. Use a washer on the rib underneath each nut and draw them up tightly. It will be necessary to bevel or plane down the leading end of the keel. From the inside of the boat, fasten down the bottom so that it will be held in contact with the keel, through the holes indicated in the plan. The screw heads should be well soldered, both for a watertight seal and to cover them.

The aid of a tinsmith will be of value in forming the air tanks. The one in the rear of the boat is attached to the underside of the seat, so as to be removable. It will be necessary to use the spreader in order to fit them in place, and after the spreader is removed they will be held tightly. It will be found that the forward tank, although not attached to the forward seat boards, is also well secured. Both tanks can be removed at will by use of the spreader in order to paint under the seats, or for any other reason.

Final touches consist in covering the rear corners, and the bow, installing oarlocks, motor block and wood flooring, and then painting. You can afford to buy the very best marine paint available, because your metal boat is very economical and a little paint will go a long way.

When completed and painted, the boat can be left afloat or ashore in the rain or in the heat of midsummer sun, without harmful results. There are no seams to shrink open when the boat is dry. No sensible worm or borer would even consider attacking the "Zinky Dink." If a cloudburst fills her to the gunwales, she won't sink because she can't—the fore and aft flotation tanks won't let her.

Large scale blueprints for *Zinky Dink* are available for $1.50 postpaid. Send check or money order to Fawcett Publications, Inc., Greenwich, Conn. No. 942

Low-cost knockdown kits for this boat may be had from a Michigan manufacturer whose advertisement appears elsewhere in the magazine.

BILL OF MATERIALS, "ZINKY DINK"

METAL

1 sheet 20 ga. galvanized steel, 120"x36", bottom
1 sheet 20 ga. galvanized steel, 40"x30", bottom
2 sheets 20 ga. galvanized steel, 7' 1"x30", sides
1 sheet 20 ga. galv. steel, 40"x30", transom and foredeck
1 sheet 28 ga. galv. steel, 6'x40", flotation tanks

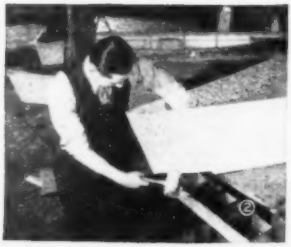
LUMBER

14', ¾"x1" oak, side ribs, flooring to suit
16', 1¼"x1" oak, bottom ribs
28', 1"x2½" fir, gunwales
15', 1"x12" pine, seats
26', 1¼"x½" fir, seat stringers
1 piece 1"x10"x10" oak, motor pad
1 piece 14'x4"x1½" oak or L. L. yellow pine, keel

HARDWARE

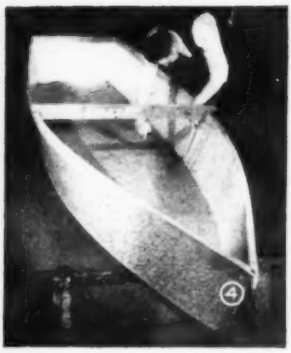
1 doz. 4" galv. angle irons
3 lbs. No. 5 galv. nails
2 gross ¼" No. 10 R. H. galv. screws
One 2" dia. sheave
1 piece strap iron 30"x⅞"
14 galv. carriage bolts, ¼"x3"
1 pr. oarlocks to suit
Solder

IN BUILDING "ZINKY DINK"



1. Turn one side over on the other and hit the seam several times with a mallet to form the bow. 2. After fitting sides to bottom, mallet and lock-seam up against the sides all along.

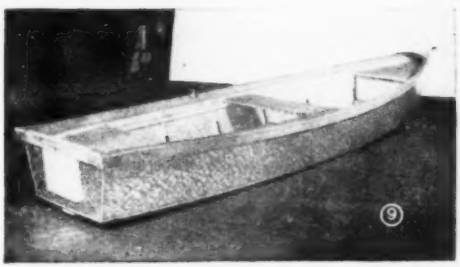
3. Attaching the gunwale. No. 5 galvanized nails are knocked through the fir strip and clinched on the outside.



4. Soldering. This should be done on the inside and the iron should be hot and heavy enough to flow solder smoothly and evenly into all parts of seams.

5. Four-inch galvanized steel corner braces (angle irons) hold side and bottom ribs firmly in line.

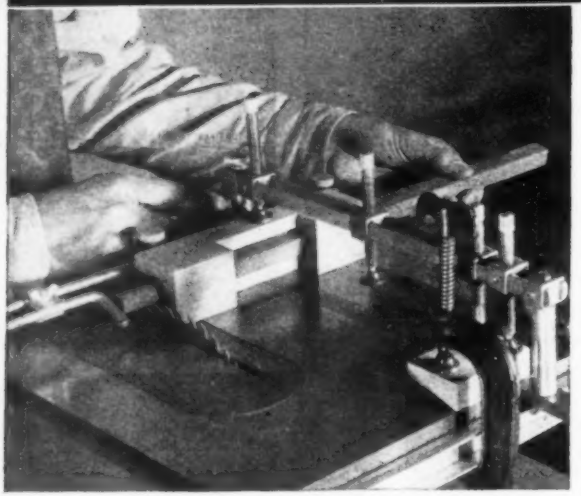
6. To insert the 43-in. spreader, take the position shown here and press the side out with one foot.

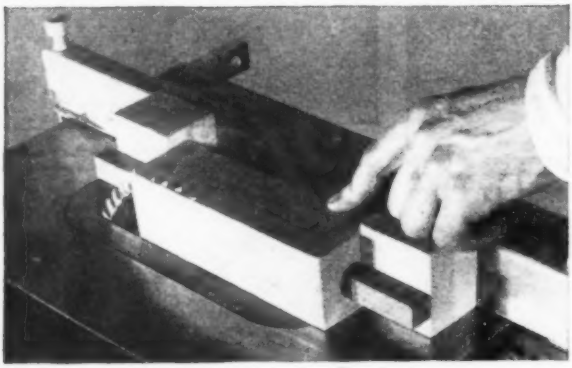


7. Installing the rear flotation chamber and part of the seat. After the spreader has been removed they will be held tightly. 8. The forward deck is held in place by bending the edges underneath the gunwale, as shown. 9. The completed boat, ready for a paint job and years of service.

Useful Accessories for T

by
Howard R. Heydorf



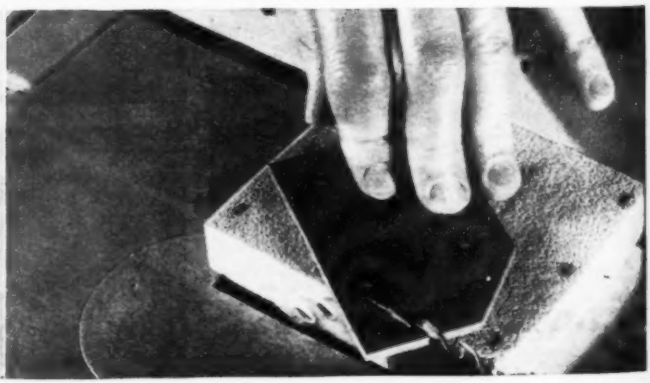


ALTHOUGH the home workshop circular saw is usually very complete in itself, the craftsman will find that the addition of a few simple jigs will greatly increase the scope and ease of operation of his machine. The ideas shown in the illustrations will be a great aid to the craftsman who must do a great variety of work on his saw.

In the construction of furniture it is often necessary to cut round tenons on the ends of square stock. A good example of this is the rungs used in chairs. A simple device that will do this operation quickly and accurately is shown in the photo. A hole is drilled through the length of a wooden block about six inches long. The diameter of this hole should be the same as the diagonal of the stock to be rounded. As it is very difficult to drill this hole perfectly true the block may be trued up as shown. A rung is placed through the hole and tacked to two wooden blocks of equal size which slide along the rip fence. As the hole is now parallel to the

Top: Using a jig as a lathe to shape the round tenons on the ends of chair rungs. Center: Using two small blocks to square the other.

Right: A sandpaper-covered wooden block holds small pieces for shaping on saw.

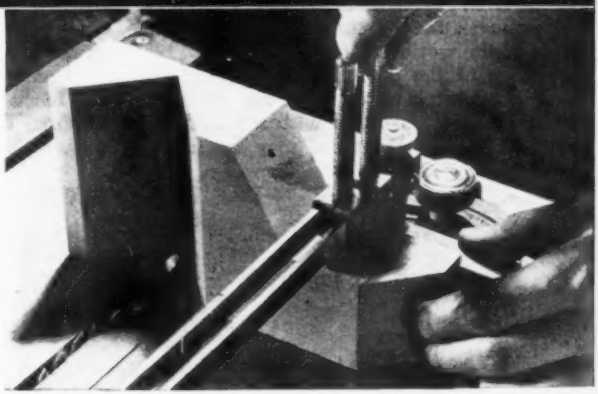


The CIRCULAR SAW

fence the material may be passed through the blade to true one side. The block is then turned and a second side is cut after which the block is squared in the usual manner. The center section may be partially removed as shown. The block is clamped or screwed to the miter gauge and the rung slipped through the block. The miter gauge is adjusted and clamped in position so that the saw will remove the corners and round the stock as the rung is revolved and moved lengthwise in the block. The stop rods on the miter gauge may be used to limit the length of the tenon.

A handy jig that will quickly center lathe squares of any size and groove them for the lips of the live center is shown here. A block is cut to the shape shown here with two 45-degree cuts made in its face to form an upright notch. This block is clamped in the miter gauge with the notch centered over the blade of the saw. The turning square is placed in the notch and passed over the saw after which the square is turned to 90 degrees and the process is repeated.

An improvement over the ordinary clearance block which is usually clamped to the rip fence to provide clearance when cutting a number of short pieces to length is shown here. The block is notched to fit over the rip fence and thus eliminates clamping. A shoulder is cut on the inner edge of the block against which the material fits. This shoulder is exactly one inch from the rip fence. This simplifies setting the fence. The work is pressed against this shoulder

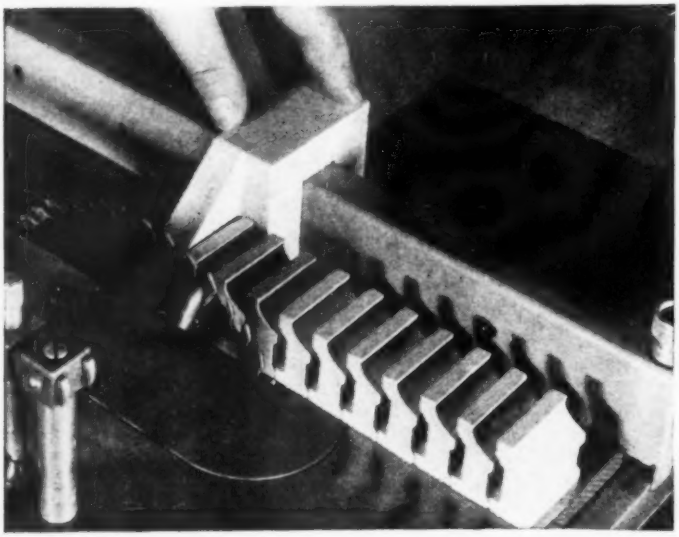


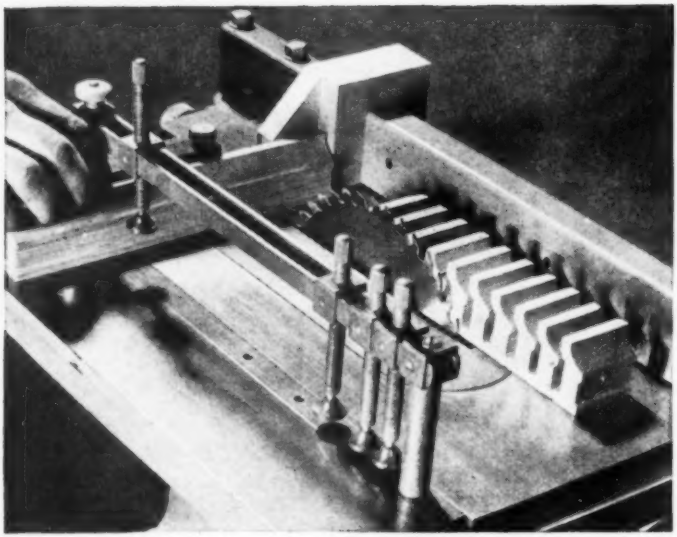
Top: Wooden block clamped in miter gauge ready for saw. Bottom: Using wooden block for centering lathe stock by crossing the two saw cuts.

to measure the stock for each succeeding cut. At any time to clear the cut blocks from between the fence and the saw the operator need only push forward the clearance block along the rip fence. The wooden section extending from the shoulder contacts the blocks and removes them with no danger to the hands of the workman.

Because of the difficulty of grooving the edges of wide pieces of wood the rip fence of the saw may be fitted with a raised rail against which the material may be rested. Two wooden uprights are fastened to the back side of the rip fence and a wooden rail fastened along their top ends. The working edge of the rail should be directly over the working edge of the rip fence.

When thin pieces of material are ripped on the saw and the rip fence is moved out on the bars as shown, it is extremely difficult to prevent the material from slipping under the fence and causing an inaccurate cut. This may be prevented by fitting the rip fence with an L-shaped piece of wood as shown. This is fastened to the fence so that the shoulder on which the material rests is in line with the table.





Top: Using clearance block to push out the cut blocks from a saw. Bottom: Butting the material to be cut on the block

For holding small material that cannot be held in the miter gauge the craftsman may use a sandpaper covered block. The paper of a course grade is fastened to the wooden block with tacks or glue. This block slides along the rip fence. The material to be shaped is placed on the block in any position desired and will be held firmly with a slight pressure of the fingers.

When the table of the saw is adjusted at an angle for beveling the rip fence unless clamped each time will slip down the bars and fall to the floor. A simple method of preventing this is to slip a dowel rod through the end hole of the gauge bars. This will prevent the fence from falling and yet the dowel may be instantly removed.

The construction of the average saw table is such that these hints

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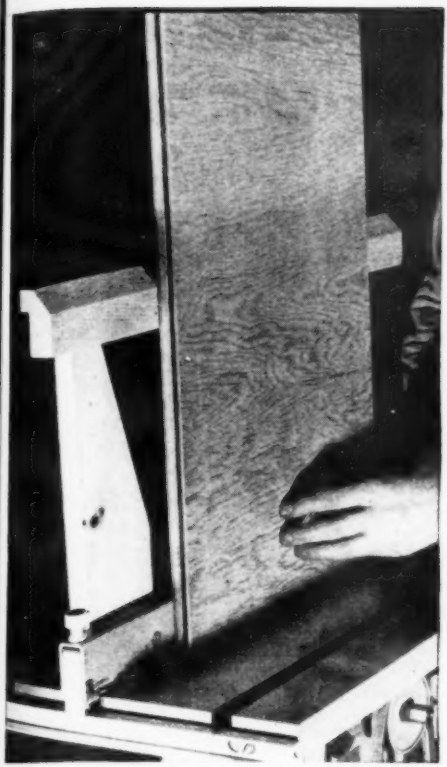
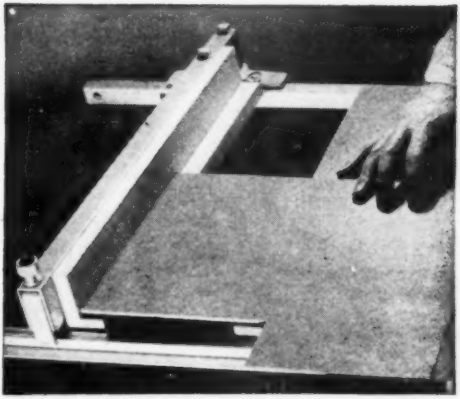


Above: Using a raised rip fence rail for easy grooving of wide materials in a saw.



Above: An L-shaped piece of wood will prevent thin stock from slipping under fence. This aids greatly in cutting plywood, etc.

machine can be used only for the purpose commonly attributed to it. It pays to use considerable imagination when confronted with a job that seems to be beyond the scope of your shop.

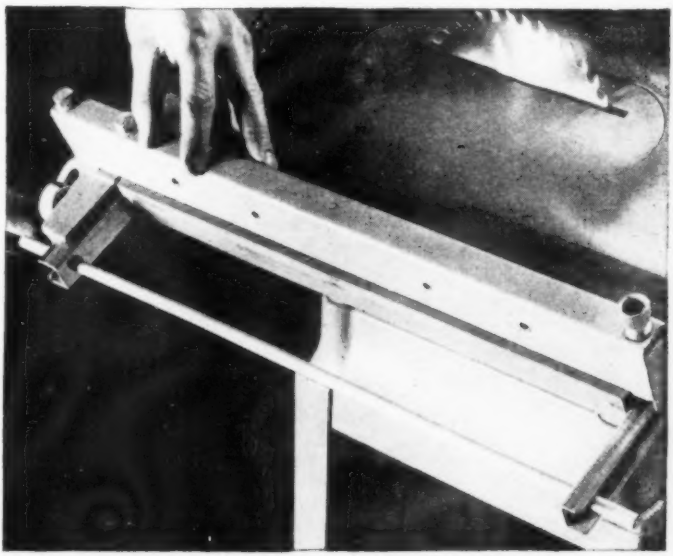
Even the extremely simple and inexpensive power tools that lack the equipment of their more lavish brothers, may be made to turn out beautiful work of the most complex nature with the aid of easily made accessories.

When any particular type of work is done more frequently than other types, it is usually possible to develop quite a number of helpful gadgets to aid in handling its various phases.

would apply to almost any standard model circular saw.

The general idea outlined for turning the round ends of chair rungs by rotating in a block on the circular saw table, can easily be expanded to include many of the other operations usually requiring the services of a lathe.

A great many owners of shop equipment are hampered somewhat in getting the most out of their power tools, by the impression that a given



Right: A dowel through the gauge bar holes keeps the rip fence from falling when tilted.

I EARNED $300 WITH MY CA

by Arnold Carlson

A LUCKY chance opened my eyes to the possibilities of making other people pay for my fun with a camera. It happened like this:

One night a local church choir held a costume party and a friend asked if I could take a picture of the group. Armed with my unimposing 6x9 cm plate camera, a hand-held flash gun, and two flash bulbs, I faced the group of thirty people and tried to act as if I knew what I was doing. Two open and shut flash shots were made and I gathered up my equipment and left for home, informing the group that I would deliver the prints to the director in two days. When the films were developed, two fairly good pictures resulted, and imagine my surprise and pride when I later received an order for $8 worth of 5x7 prints! This was my cue to get some adequate equipment and to scout around for more pictures to take.

Any camera having a bulb or time setting and provision for a tripod socket is suitable for open and shut flash shots. Of course, a regular flash synchronizer will give you more certain results, but I make my equipment do.

With sample equipment consisting of a camera, tripod and hand-held flash gun you are ready to go out and take some pictures that will bring home the bacon. I found that the best way to drum up business is to contact the secretary of an organization, the director of a choir, the coach of a team, or the teacher of a class. Find out when these organizations are going to be together and explain that you would like to photograph the group. Explain that there will be no charge for taking the picture, but that copies will be available to the members at a small cost. Deliver the prints to the secretary or some responsible person and offer to give him, or her, a set of the finished prints in return for taking the names of those who wish copies,

CAMERA

and collecting the money for you.

Most of these groups or organizations have probably never thought of hiring a professional photographer to take their picture, but most of them will be willing to do business with you on this basis.

I was recently called upon to copy some old family pictures for a friend and this job resulted in many more of a similar nature as soon as a little word-of-mouth advertising got around.

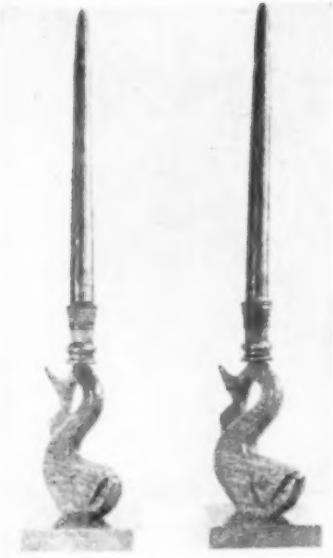
Any alert amateur can find dozens of ways in which to take pictures that people will buy. Volunteer to take shots of a garden-lover's prize blooms. He won't be able to resist buying a half-dozen or more prints. Shoot your grocer's store-front when it is decorated for a special sale. He won't turn you down when you show him the prints and perhaps you can pay the grocery bill with this barter method. Perhaps you know of a local inventor who will need photos of his gadgets for publicity purposes, or a woodcraftsman who would like to have pictures of his work. The list of possibilities is almost endless.

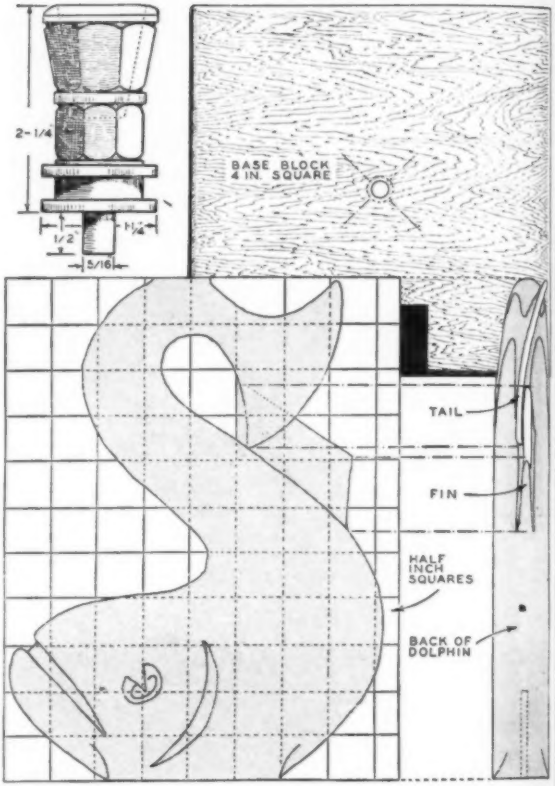
The matter of charges is up to the individual, of course. I usually charge $1.50 for taking the picture. This includes an 8x10-in. print. Extra prints are usually 35c for 5x7, and 50c for 8x10-in. prints.

One job will lead to another until before you realize it, you are adding a substantial sum to your income every month, just by spending a few evenings a week doing what you like to do best—taking pictures.

Pictures illustrated on this and the opposite page are easy to sell to friends and relatives. Most everyone wants an informal snapshot of himself. Although reluctant to trouble posing for a studio shot, friends are glad to buy your pictures as a memento of past events.

DOLPHIN CANDLESTICKS Are Easy to Carve





EARLY candlesticks were made in many interesting patterns and often incorporated forms of birds, animals and fishes. The dolphin pattern was a favorite design that was used in many variations.

These dolphin candlesticks are imitated here in wood so the home craftsman can make them in his shop with very pleasing results. Black walnut is great wood to use for this project but any hard, fine-grained wood can be used. Material 1-in. thick should be used. A piece 5½-in. by 4¼-in. is needed for each of the dolphins. The dolphins are first marked out on the wood and sawed out with a jig saw. They are shaped with a sharp pocket knife. Do not finish the surface too smoothly for the chipped finish left by the knife should be preserved to represent fish scales.

The eyes, gills, mouth and grooves in the tail and fin are made with the sharp point of the knife. The tail and fin are carved so that they overlap as shown in the back view of the dolphin. The dolphin is mounted erect at the center of the base block by a 1¼-in. flat head wood screw driven from underneath. The base block is sanded smooth and the corners slightly rounded. Set the dolphin cornerwise on the base.

The candle sockets at the top are made from round blocks 1¼-in. in diameter and 2¾-in. long. These can be turned on a lathe or cut out with a knife the same as the rest of the work. The tapering hole for the candle is made to fit the base of a 12-in. candle and one of these should be at hand when the hole is made to insure a good fit.

The candlesticks can be contrasting woods. —*Harold Jackson.*

Make A Walnut TILT-TOP LAMP

by B. Nielsen

The attractive and unusual lamp described here may be hung upon the wall or placed on a table as desired. It is cut to shape with a jig saw, and assembly is very simple. Note switch on base.

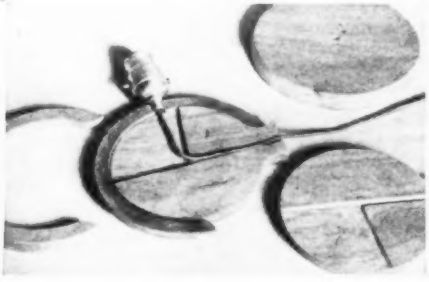
THIS novel lamp may be used on a table or hung up on the wall and is also suitable for use as a bed lamp.

For the base, cut a circular piece 7-in. in diameter, from ¾-in. walnut stock. With the jig saw set at a 10 degree angle, cut 2 identical pieces to shape shown, for the standard, which measures 7-in. At the same angle, cut off a ⅝-in. ring from each of these pieces. Next 3/16-in. strips are cut off the inner sides of these rings. Discard one and place the other between the two thicker rings, with the grain running opposite to that of the outside pieces. Now measure from one end and cut off one quarter of this ring assembly.

Cut out space in center section, as shown, to make room for wire, and to permit wire to slide with socket, as the turning rings are moved. Glue center sections together and place rings over center section, and glue.

Bore a hole in the ring for the nipple of the lamp socket. This nipple, which acts as a guide, must be long enough to extend down into slot.

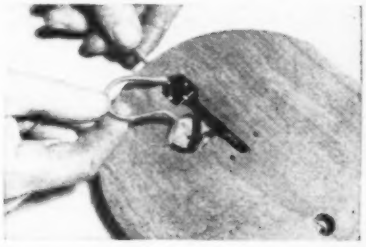
Cutting the parts from a ¾-in. thick piece of walnut. The rim must be a snug, sliding fit on the center section.



Cut out space in center section to make room for wire, and to permit wire to slide with socket as turning ring is moved.

Lower left: The three rings which are glued together to form the rim.

Below: Installing a canopy switch in the base of the lamp.



The Sky's The Limit!

[*Continued from page* 38]

part of the Civil Aeronautics Authority program.

In 1939 Al sold 115 light planes "over the counter" and would have sold more if he could have obtained deliveries from the factory. It helps a lot to bear out his theory that most people want to fly, and that those who don't would if they knew something about it. Nobody, according to his viewpoint, is too old or too young to fly. He has taught ministers, businessmen, housewives and newsboys, and his only regret is that he can't teach more people. And that brings up the Bennett Plan.

The Bennett Plan is Al's answer to those who want to fly and don't know how to go about it. It's also his answer to the criticism of the Government's CAA program, which went into effect last September.

"Don't misunderstand me," Al told this interviewer. "I think the CAA program is a wonderful thing but I don't think it went far enough; it left the average citizen more or less 'out in the cold.' The CAA concentrates its training on the young students in colleges. That's swell—but what about the thousands who want to fly that have never been to college, and never will go?

"I went to college and I'm glad I did, but I know enough about flying to realize that it doesn't take a college education to make a first-class flyer. Take my chief instructor here at the field, Eddie Lambert. Eddie was jerking sodas in a Philadelphia drug store at eighteen a week. He wanted to fly. He wanted to fly so badly he scrimped and saved for five years to get enough money to team up with a friend and buy a second hand plane. Flying in his spare time, he managed to get his private license, his commercial license and his instructor's license. He was able to quit working in soda fountains and take a job as an instructor. He's chief instructor here, he's flight manager of the field, he's had 1100 flying hours, and believe me, he's a swell pilot!

"It's people like Eddie Lambert that my plan is aimed at, non-college kids who want to fly and who are potentially crackerjack pilots!"

Boiled down, the Bennett Plan, which would train 100,000 pilots and cost the Government 10 million dollars, would work out like this: In towns where there are airports, those who wanted to fly would apply for Government scholarships. The Government would issue each physically fit applicant two coupons valued at fifty dollars each. The would-be flyers would take these coupons to the local flying instructor and turn them over to him in exchange for flying instruction. The first coupon would be redeemed when the student soloed; the second after he or she finishes ten hours of flight. To keep those who fly in trim, all non-commercial pilots could get two coupons when they renew their licenses, cash the first coupon after ten hours of solo flying, and the second after another ten hours.

In a town which has no airport, a group of people would form a flying club and rent a field for anywhere from fifteen to fifty dollars a month, thereby starting a new airport. Club members could pool their coupons and put them together as collateral for a down payment on a plane of their own. Ten members, each with coupons valued at $100, would mean $1000, nearly enough to pay in full for a new light plane. All the training and instruction would come from an instructor hired by the club, at a cost per person of about sixty-seven cents a lesson, beside the small operating cost of the plane.

Aviation and Government people like Al's plan because it could be started overnight, because it would boom the manufacture of the popular-priced "flivver planes," would establish airports all over the country, create jobs for thousands of people, increase and improve manufacturing facilities and, above all, give the nation 100,000 reserve pilots at one-sixth the cost of a battleship!

Senator D. Worth Clark, of Idaho, who introduced the Plan in the Senate as a bill, on April 17th, has this to say about it: "The Bennett Plan, if enacted into law, will go a long way toward assisting those young men and women who have previously obtained their private flying licenses with much personal sacrifice. Not only the pilot, but the airport operator will benefit. We have many small airports throughout the United States which are badly in need of the help that this bill will give them. Aviation would not be what it is today if those men who operate the small airports throughout the country had not pioneered the field, and offered instruction to our young men and women outside the large aviation schools. I will be glad to see them get the recognition they deserve when the Bennett Plan is passed."

If the Plan doesn't go through, it won't be because of any lack of effort by Al Bennett. He's throwing every ounce of perseverance and salesmanship he's got into making the Government see the light, and hardly a day passes that doesn't find him either flying to Washington or New York, or talking to aviation big-shots by long-distance phone about the Plan.

But even if the Government should turn it down, it wouldn't break his heart. He's not the type.

He'd go right on with his one-man campaign to make this country a nation of flyers, just as he has been doing for the last ten years . . . by starting flying clubs around the country, by talking small towns into getting airports, by teaching as many people as he possibly can to fly.

His platform is "A hangar in every back-yard and two planes in every hangar," and he won't be grounded until it's a fact!

Easel Tilting Ends Distortion

[*Continued from page 79*]

ply, was cut the same size as the paper holder. On the underside, in the center of this board, a nut of the proper size to take the tilt-top (in this case, a nut 3/16 in. inside dia.) is set into a chiseled out square. Over this a washer is screwed to hold the nut in place.

In use the apparatus is placed on the baseboard of the enlarger. When the correct amount of tilt for straightening any leaning lines has been found and the image framed and focused, a clamp should be used to fasten the apparatus to the enlarger base. The wing nut on the tilt-top should also be tightened to prevent movement when the ruled sheet is withdrawn from the paper holder and the projection paper inserted.

Test strips must first be exposed to determine the correct exposure time, the evenness of the light distribution and the over-all sharpness of the image. It might be well to mention at this point the advisability of exposing for negatives on the thin side, when it is known distortion will have to be contended with. Otherwise the exposure necessary for printing will be prolonged with danger of overheating and damage to the negative. Just one last warning, distortion correction, like retouching, can be overdone. Most negatives will require only a small amount of correction to achieve a surprising result.

Dustless Film-Drying Cabinet

[*Continued from page 80*]

completely over the front, very snugly, too. Care should be used here because of dust that might otherwise get in the drier and settle on the film.

Make a small frame for silk or filter cloth to protect the film from any dust that may be blown in by the drier. Locate this as shown in the drawing, about 6 in. from bottom of film housing.

Bore two ½-in. holes in top of each side for air release for the circulating warm air.

Put on door handles, screw eyes and hooks, as shown, to hold door tightly closed when in use.

Screw to the wall by using the back braces as wall brackets and you have a completed drier for small size film.

One or two suggestions about how to use this drier might not be amiss at this time as there are several ways of drying your film in it. First, you should turn your film, end for end every few minutes as the amount of heat will curl film if this is not done. Or you can turn the drier off every few minutes to eliminate the curling. This latter method is slower, but will prevent the film from curling. Lastly, do not under any condition, leave the drier running too long without watching the film, as the heat gets increasingly hotter.

From 100 pounds of shark liver, 80 pounds of refined oil rich in vitamin A can be obtained.

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Riding With Trouble

[*Continued from page* 51]

In Utah, Goodyear seeks one answer to a tire's stamina through high speed runs over the salt beds. Here, free from traffic dangers, cars race between ninety and one hundred miles per hour around a twelve-mile circle.

Salt brine seeping through the crust sprays the cars and is quickly dried by the intense heat. As this is repeated, cars soon take on the appearance of having passed through a blizzard in mid-summer.

For a job that the drivers describe as "just ordinary drivin'," they manage a lot of strange experiences. Once Maxfield and a co-driver were hi-jacked on their way south with a truck load of test tires. They were kidnaped and spent the hottest afternoon of the year riding around New York City locked in a rumble seat.

"Outside of that it wasn't so bad," Maxfield said. "They brought us cards and magazines while they held us in a West Side apartment."

They were finally taken to one of the subways, released, and told to ride to the end of the line before reporting the theft. Police caught the gangsters three days later through a tip.

But the greatest enemies of all test drivers are not gangsters, blowouts or salt-brine blizzards, but animals—cows, horses and pigs.

A Goodyear test truck riding through Arizona one day reached the brow of a hill to be met by a herd of stampeding cattle. The truck stopped, but the cattle did not. Five of them crashed head-on into the radiator and fenders.

Animals are completely unpredictable. Motorists in southern states never know when they come over a hill or around a curve whether or not they will meet a meditative cow standing directly in their path.

Pigs are worse than cows or horses, the test drivers say. A pig running under a wheel can make a seven-ton truck turn somersaults.

In Florida one night a driver hit a cow that had evidently been pacing the highway with insomnia. The test man found himself catapulted into the back of a truck full of grapefruit that had been coming the other way.

Finally a group of ingenious drivers found the answer to herds that stand in the center of the road and refuse to move. During Christmas in the south, where the winter holidays are still celebrated with fireworks, they bought a box of toy torpedoes. After that stubborn cows found a barrage noisily but harmlessly exploding in the vicinity of their backsides.

One crew member returning from a night run summed up the longing of his fellows when he remarked wistfully:

"There ought to be a law. All black cows should be made to wear tail-lights!"

If a ticking watch disturbs a sick person, the watch can be placed on a folded handkerchief and covered by an inverted tumbler.

Tractor Makes The Rounds!

[*Continued from page* 61]

tractor ended at the barrel, the entire field had been planted.

This was so successful that he divided his whole field of 88 acres into the smallest possible number of circles. He might have needed fewer circles if the field had been square, but since it was rectangular, he had to make several circles. As it turned out, the present setup will allow for perfect crop rotation, since all the circles are not planted in the same crop.

Last year, only part of the field was planted—seven circles in corn and three in oats, but this year the whole field will be devoted to circle farming. Only 88 acres will be under cultivation, the balance being in timber and pasture.

Not only does the automatic device plant the seeds, but it does all the cultivating and Frank feels that he will be able, this year, to harvest with it also.

He has made a number of improvements on the original idea, using a drum instead of a barrel. The drum is like a wheel, revolving on an axis, and is secured by stakes driven into the ground. Andrew has so perfected the idea that the tractor will start at the outer edge of the field, follow the rows to the center and then work out again. He also hitched two plows together and made a double row. The width of the row is regulated by the size of the drum. For cultivating the double row, he fastened together two single-row cultivators.

Last year, the tractor worked automatically day and night without the need of a human hand to guide it. Frank sets the machinery going in one of the fields, then goes about his other work, or if he has business away from home, goes away and leaves it.

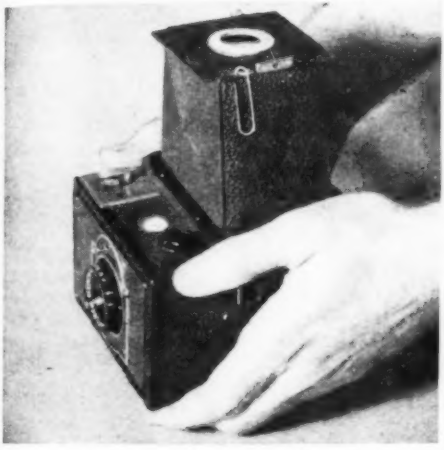
He admits that his device isn't perfect, though. It works much better on level land and though he hasn't tried it, Frank says he doesn't think it would work so well on rolling ground. He hasn't yet figured out what to do if the plow gets clogged or runs into a snag, but with his mechanical ability, he will probably get around that difficulty.

If you think the cost of rigging up an automatic farm is prohibitive, you're mistaken. Frank says the devices he is using altogether cost him less than $10. Most of the materials were already on hand. It was chiefly a case of employing odd implements, time, and a lot of ingenuity.

Frank applied for patents on his inventions, and found that a lot of others had conceived the idea of farming without labor. But there was a difference between his idea and the others. His worked!

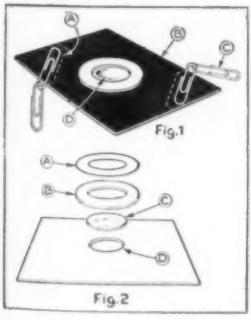
Home economists say that an egg that is not cooled quickly and handled carefully may become stale in a day or two, whereas an egg properly handled and stored may keep "fresh" qualities after several months of storage.

Magnifier Hood for Reflex Camera



THE magnifier hood illustrated shades the ground glass and gives an enlarged image, thus making sharp focus a simple matter.

Materials required are four paper clips, a small piece of cardboard, some medium weight paper and a small magnifying lens. The drawing below (Figs. 1 and 2) shows how the magnifier hood is assembled. The exact dimensions of the hood depend on the size of the opening above the ground glass in the reflex camera. Paper clips hold the magnifier in place. If one clip is released, the other acts as a hinge for swinging the magnifier out of the way. Rubber cement was used in all operations and the hood blackened with flat black. Fig. 1-A: Indicates where triangular paper cemented over clip to provide a hook. Fig. 1-B: Hood frame. Fig. 1-C: Linking clip. Fig. 1-D: One-inch diameter lens. Fig. 2-A: Paper washer to fit over lens. Fig. 2-B: Paper washer to fit around lens. Fig. 2-C: Magnifying lens. Fig. 1-D: Hole in cardboard is slightly smaller than lens diameter.



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Top: Photo shows the magnifier attached to the reflex camera. Left: Details for making magnifier.

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Catching The Tough Guy!

[*Continued from page 57*]

success, a way had to be found to remove the armor layer. This is accomplished by a patented process in which the skins are milled with an acid solution. Shark leather is difficult to scuff, even with a knife blade, and it wears so long that an article made of it may have to be restitched several times before its useful life is over.

If a shark has liver trouble, it deserves some sympathy, for one-fourth of its weight may be concentrated in that organ. Most of the oil in a shark is found there. Extracted and refined, it is used for tanning leather, tempering tools, making soaps and paints, and for providing vitamins in diet. It is one of the cheapest sources of vitamin A. Dogs fed a shark-oil ration in tests resisted distemper, developed beautiful coats, and otherwise were in good form. Poultry on a shark-oil diet showed a 15-per cent decrease in mortality.

In some localities, fresh or salted and dried shark flesh is used for food. But generally it is discarded entirely, or is converted into shark meal which is useful as a stock food or as fertilizer. Shark meal has a high vitamin content in addition to its abundance of protein. It contains practically no fat.

Some sharks such as the Leopard and Man-Eater provide 150 to 200 commercially valuable teeth each. These teeth, of peculiar shape and as sharp as a knife blade, are arranged in several rows around the jaws. The Leopard shark has seven rows. As the outer teeth wear or are injured and drop out, new ones unfold to take their places. They are not imbedded in a jawbone, but are held by the gums, and are easily removed. They serve as trinkets, watch charms and souvenirs. Sections of the spinal columns of sharks also are sold as curios. The eyes of the shark produce jewel-like ornaments for stickpins and other trinkets. They are placed in water that is then heated to boiling. The lenses drop out and harden, and then resemble lustrous moonstones.

The ferocity of the shark seems to be an unsettled question. There is, for instance, the account of how the Malay shark "Ikan Yu" was responsible for the loss of many lives in a ship disaster in the Straits of Rhio. On the other hand, there is the claim that many waters where swimming is popular are swarming with sharks, yet no swimmer ever is attacked.

The shark gets a lot of blame for dirty work done by the ferocious barracuda, which will sink its sharp teeth into anything that moves near it, and has caused innumerable deaths and injuries. Some sharks could not bite a swimmer if they wanted to because their teeth are designed only for straining plankton and small fishes out of sea water. However, if you watch a veteran shark fisherman, you will notice that he has a genuine respect for all sharks. Those razor blades in the ample mouths look too formidable to trust very far. Even though a shark may normally not attack man, any animal that is hungry or injured may make use of any armament it has.

Sharks are related to skates and rays, and belong to the class known as *Elasmobranchii*. They have a skeleton of cartilage instead of bone. Some sharks are bigger than whales. Most of those caught measure fifteen feet or so in length, but the basking shark reaches forty and the whale shark grows to a length of seventy feet. Some of these giants have been known to capsize small boats with a flick of their tails. Sharks occur in all parts of the sea, although most of them prefer the warm waters in and near the tropics. They move about according to season and food supply, which accounts for the fact that shark fishing in an area that once was excellent may drop to zero.

One of the Florida shark fisheries is located at Salerno, near Stuart. The men who operate it had, during one winter, an extra job: they were nurses for two captive sand sharks imprisoned in a steel-fence enclosure near the mouth of a river. The sharks had been caught by a man who put them to sleep with hypodermics until they could be transferred to the pen. The animals were captured for use as actors in underwater movies.

By obtaining iodine from waste brines of the West Coast, the United States has made itself independent in iodine supplies.

"Captain, I don't think you made it quite clear to Kennedy when you told him to shoot the sun!"

Routing The Radio Pirates

[*Continued from page 64*]

licenses; monitor radio transmissions of all kinds; and investigate complaints of interference to radio reception.

Since there are more than 50,000 legitimately licensed amateurs in the United States, it is comparatively easy for a bootleg station to lose itself in the never-ceasing confusion of dots and dashes on the short-wave bands. However, the alert ears of inspectors at the fixed monitoring stations soon notice something unusual about certain signals they pick-up. The station is on the air too regularly and the transmissions themselves, if they are not already cryptograms in some form, certainly are not the usual type of amateur chatter. The word goes out to the roving field cars, and sooner or later, almost miraculously, the pirate is found. Who is he? There are few public records of these cases, because the United States is not at war with any nation, but it is obvious that short-wave radio affords a cheap, direct and rapid means of overseas transmission of intelligence that the senders—and receivers—would rather not entrust to the mails or ordinary diplomatic channels. Sometimes the offender is merely a harmless experimenter, and he gets off with a stiff fine and a warning.

Correct Answers to Quiz on Page 65

1. True	13. True
2. False	14. True
3. True	15. False
4. True	16. True
5. True	17. False
6. False	18. True
7. False	19. False
8. True	20. False
9. False	21. False
10. False	22. True
11. False	23. False
12. True	24. False

25. True

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Army Streamlines Its Rations

[*Continued from page 59*]

take, the new ration is an improvement nutritionally. Concentrated foods can be made much more palatable now, as a result of research in recent years.

Calories are the strong point of the chocolate-soldier ration of 1940. Calories are what an emergency ration is expected to supply, in greatest possible quantity. Calories, which the lady-on-a-diet considers a word to shudder at, are vital to a stranded, hungry man, perhaps on outpost duty and cut off by mischance from his division.

The little packet represents 600 calories, or units of energy-producing food—sugar, starch, protein, fat. That is about the amount of calories in a lunch or light dinner. But understand, the little emergency ration is not, emphatically, a balanced meal. It is no proper substitute for a regular lunch or dinner. It has one job to do—supplying staying power and energy to enable a man in time of emergency to keep going.

"In rationing for emergency," says Major Paul P. Logan of the Army Industrial College, "the problem is to pack concentrated energy food into smallest possible space and into a package that will resist wear-and-tear, including heat up to 120 degrees, and even war gas."

Major Logan conducted research for the new chocolate ration.

"The most highly concentrated food we know of would be fat," he explains. "Pure fat, with no water in it, would provide 4,100 calories to a pound. But the fat would not be edible. The chocolate ration, representing 2,400 calories to a pound, is the nearest approach to straight fat that we could make edible."

To aid the army in the research task of making a weather-proof, gas-proof wrapper for the ration, the National Bureau of Standards tested various materials. The result is a three-layer wrapping. First around the chocolate bar goes aluminum foil heavier than that on ordinary candy. This forms a hermetic seal. Then comes a wrapper of white vegetable parchment, which becomes tougher in damp weather. An additional overcoat of green paper is simply what is technically called a bumper, and it takes the label, "U. S. Army Emergency Ration," with a warning not to eat the ration fast—take half an hour.

To make sure the ration would not go soupy in the tropics, the Quartermaster Corps has already given it experimentally to American soldiers in Panama, Hawaii, and the Philippines to carry in their pockets, haversacks, and saddle bags.

As a stiff war conditions test, some of the ration packets were turned over to the Chemical Warfare School at Aberdeen, Maryland. There, for three hours, the ration packets were bombarded with fumes of mustard gas. Then, peeling off the protective wrappings, army chemists fed shavings of the "gassed" emergency ration to laboratory rats. The rats showed no ill effects, so the army feels confident that it has a gas-proof wrapping.

The Quartermaster Corps does not call its new chocolate ration an emergency ration, says Capt. John Powers of the subsistence division of the Quartermaster Corps. Ration D is the correct, official name. The pocket ration fits into the army's new set of alphabet names for field or wartime rations: A, B, C, and D.

Capt. Powers says American soldiers enjoy singing.

"They feed us carrots every day,
"Wonder when they'll feed us hay?"

And they like to echo the bugler at mess call, chanting:

"Soupy, soupy, soupy without a single bean,
"Porky, porky, porky without a streak of lean,
"Coffee, coffee, coffee, the thinnest ever seen."

But actually, the American soldier is the best fed in the world. To make field and wartime rations as near as possible to the peacetime garrison ration, the Quartermaster Corps devises ingenious plans for transporting, packing, space saving. It mounts field kitchens—a new model was recently christened—on trucks and transports them to camp grounds, to insure hot food whenever possible. It has even landed eggs and other perishables by parachute from planes. Quartermaster officers can tell you that by trimming and boning a ton of beef, they can reduce 134 cubic feet of beef in shipping to a mere 32 cubic feet.

So, Ration A, which is the preferred field ration, is complete with fresh vegetables, butter, fruit, meat, and other bulky but desirable foods, Capt. Powers states. Ration B is similar, with substitution of some canned goods, jelly instead of butter, and hard bread for fresh. The army goes on Ration B when it moves in streamlined transport minus everything but necessary equipment.

A brand-new Ration C—the reserve ration—also streamlined, has been evolved. Taking its first large-scale test in April and May, the new Ration C will be fed to 65,000 soldiers during the spring maneuvers in Mississippi and Texas.

Reserve rations are nothing for a soldier to cheer over. But the new one, so new that labels have not been made yet for cans, is rated a big improvement over the one that has been used. Ration C is a two-can meal, to be eaten either hot or cold. One can contains a meat and vegetable combination, and there are three variations on this. The other can contains sugar, soluble coffee and nine biscuits. Rationed out to the men at the rate of six cans a day, this reserve chow provides four pounds of food for a day. This is less than the American soldier is accustomed to regularly, but then the reserve ration is intended only for use when normal transport is interrupted, and the Quartermaster Corps does not recommend its use even then for more than three days, at the most.

Microscope Opens New Fields

[*Continued from page 66*]

examined are magnified by 25,000 diameters in the electron microscope. The resolving power or sharpness of definition of the new instrument is so high, however, that useful magnification may be increased up to 100,000 diameters by photographic enlargement. Ordinarily useful magnification of objects under optical microscopes cannot be achieved above 1500 diameters in ordinary light, or above 2500 in ultra-violet light, because resolution, or sharpness of definition, is lost beyond those points.

Use of the new electron microscope in the field of biological research may make possible a better understanding of bacteria and the observation of filtrable viruses and other similar bodies to which are attributed many human illnesses. In addition it should become an instrument of great usefulness in industries, in the study of organic and inorganic materials for many purposes, and in industrial colloidal chemistry in which are involved phenomena produced by extremely small particles which cannot be seen by the optical microscope.

The useful magnification of the finest optical microscope possible is limited by the very means which it utilizes for observation, light itself. Many objects, including some bacteria and filtrable viruses are much smaller than the wavelength of light, and cannot therefore be seen with light. The wavelength of electrons traveling at high velocity is only a minute fraction of the wavelength of light. For example, the electron beam utilized in the RCA microscope has a voltage of from 30,000 to 100,000, and measures only one-one-hundred-thousandth of the wavelength of light.

A magnetic field can be used to bend an electron beam in the same way that a glass lens bends light. A glass lens is nothing more than a means for bending light in a special way so that it forms an image. In the electron microscope a magnetic lens is created which has the same kind of effect on electrons that a glass lens has on light.

The electron beam, which originates from an electron gun, is converged by a magnetic lens coil corresponding to the condenser lens in an optical microscope in such a way that it passes through the specimen under observation. The electron rays are then focused by another series of lens coils to form the highly magnified image, which can be made visible by causing it to strike a fluorescent screen that gives off ordinary light. This electron image may also be directed upon the emulsion of a photographic plate to make a permanent record of the image. The detail in the resulting photograph is so great that it is photographically enlarged many times in order to see all the useful information it contains.

The ordinary glass slides used for examining specimens under the optical microscope are opaque to the electron microscope. An entirely

[*Continued on page 135*]

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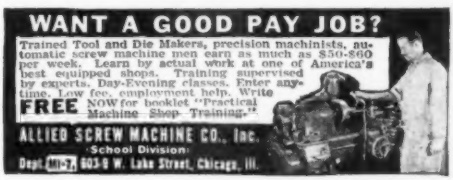
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Mechanical Engineering

[*Continued from page 71*]

neers do like to work with objects. On the desk of Igor Sikorsky, famous airplane engineer who developed the Clipper ships, stands a model of a transatlantic plane which the world probably won't see for a decade. It's an object, while the symbols which will make it come true are now merely sheaves of calculations filed in an office safe. Look at the desk of a mechanical engineer and you'll probably see a gear used as a paper weight, a piston for an ashtray—any number of objects which can be *handled*.

"Since a mechanical engineer designs machinery, and one of his main jobs is to keep industrial plants humming without breakdowns, he certainly ought to feel at home with machines," Bill observed. "I'm more than at home with them—I'm a skilled hand with a set of tools, if I do say so, and pretty dexterous at working with my hands. Doesn't that entitle me to extra credit?"

Strangely enough, it doesn't. Bill's mechanical ability is a mighty useful asset, but when you want your car repaired you take it to an auto mechanic, not to an automotive engineer. Your ability to use tools expertly is no guarantee that you possess engineering imagination. The technician knows how, the engineer knows why. The technician carries out the plans that the engineer makes. Both men are absolutely necessary in our machine age and a little self-analysis will show you to which group you naturally belong. Right now is a good time to make it clear that such jobs as locomotive driving, steam-roller chauffering, "exterminating engineers," and the like—which have their own high requirements—are not engineering vocations in the professional sense. The professional engineer, and technical engineers such as steam boiler operators, are very commonly licensed by the state or the municipality on passing certain tests.

"Here's something I don't understand," said Bill. "I managed our class debating team. I was in charge of raising money for new library equipment. I'm active in several clubs and have plenty of extra-curricular activities. But how in heck does that make me a better engineer?"

"It doesn't make you a *better* engineer, Bill," was the answer. "It just means you're more likely to be a successful one. That's a matter of statistics, not opinion. There are some branches of engineering in which a lone wolf, a solitary worker, can do well for himself. But in general the engineer has to work with people, all kinds of people. He has to persuade and organize and direct them, to put over his fundamental commodity—ideas. Group activities are a good index of that kind of executive ability."

"That's why my good rating in English is an asset, too?"

"Yes, plus the fact that a good vocabulary and ability to use it is a rough measure of intelligence. So is your general ranking in school. But if poor standing in English is a danger signal, so is too high a standing—that is, if you *prefer* writing and literature courses to the sciences, your fundamental interests aren't those of an engineer at all."

Bill nodded as he scanned the questionnaire again. "The reasons for most of these other questions are plain enough, but here you ask about my self-confidence. Why stress that?"

"Look at the thing brutally, Bill, and it boils down to this: an engineer has to have guts. You're bound to face disappointments, to come a cropper now and then. You're working in a field studded with brilliant men. Is your self-confidence strong enough to carry you through those periods when you'll be tempted to doubt your own abilities? Can you take a sock on the chin now and then without getting punch-drunk? Or would you be happier as a medium-size frog in a medium-size puddle where no big fellow will come along to outclass you?"

"I can take it," Bill grinned.

You're ready to take the test, yourself, now, for the rest of the questions are designed to find out whether these things are true about you: You can read blueprints and diagrams or will learn mechanical drawing because, with mathematics, that is the basic language of engineering. You will have had enough interest in the profession to pick up a good deal of information about it. You will be systematic and resourceful in your method of attacking problems. You will be able to manage your financial affairs and otherwise demonstrate sound judgment, for millions of dollars may some day hang on your word as an engineer. You will have a good sense of "spatial relationships"—that is, you can take a two-dimension drawing and visualize the object in three dimensions, and you can quickly assemble a pile of disordered parts into a machine.

One thing about engineering—any branch—you simply have to have technical training. It is none too early to start organizing that training in high school. Make sure that you take physics and chemistry, and all the mathematics the school offers. Don't pass up drafting and mechanical drawing, either, and work in as many shop courses as you can. You will do very little actual machining or foundry work or cabinetmaking as an engineer, but you'll be eternally grateful for what you learned in such courses. Get yourself a job as a rodman or in a drafting room or some similar spot during your vacations, even if you have to work for nothing, and you'll learn volumes about whether you'd really like to be an engineer.

An alert young chap who thought he'd like to be an engineer sat in a high school classroom in Utah back in the twenties. His physics instructor had been lecturing on electricity—electrons and ions and magnetic fields and all the rest of it. Something clicked in that student's mind, very

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Mechanical Engineering

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much as it had in the mind of Wilbur Wright when he held the cardboard box. He sketched out his idea in an ordinary classroom notebook, later showed it to his teacher and discussed it with him.

Years later the teacher testified about that discussion in court. The idea dealt with the principle of using electrons to create a visual image. The notebook and the testimony helped to clinch a basic television patent for the former high school student whose name you certainly know if you've read anything about television—Philo T. Farnsworth.

An amazing amount of technical knowledge was applied by Farnsworth before he got his device to work, of course. And that brings us to the question, "How does one get to be a mechanical engineer?"

The most obvious method is probably to take the four-year college course leading to that degree. This will cost you not less than $500 a year, and likely will run a good deal more than that. There are a number of splendid technological schools which teach engineering subjects only. Lack of space forbids a complete listing, but your local board of education or public library, or your own school authorities, will furnish complete lists. Send for catalogues, descriptions of courses, costs. Geography will no doubt influence your decision. Whatever you do, study the entrance requirements and study them early so you won't lose valuable time in taking prerequisite courses.

Mechanical engineering is also offered in correspondence courses, with the usual advantage of such courses to men who are employed all day and must do their studying in spare time. Design and operation of machines, machine tools, steam engine and boiler design, shop and foundry practice are among the practical subjects included. One representative course costs $335 and requires 4,350 hours for completion, on the average, which works out to about six years if you put in twenty study hours a week.

And then there are schools and courses and books which will train you, not to become a mechanical engineer but to become a technical expert in some branch of mechanical engineering. If that sounds like word-splitting, let's make it clearer: you can become an expert in the maintenance and repair of, say, Diesel engines, without having to make calculations and stress analyses in the designing of a new type of Diesel power plant. Naturally you can go on from that point and *become* a mechanical engineer with the proper study—no profession is swallowed in one gulp but is chewed and digested a bite at a time. There are so many of these special branches that we can't begin to list all of them here, but since you'll be practically certain to adopt one specialty sooner or later we can take one of those bird's eye views.

[*Continued on page 134*]

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Mechanical Engineering

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Ever been in a big shop or factory, jam-packed with expensive, whirring machinery? Somewhere around the plant there's a chief engineer whose job is to keep those machines going, to make sure that they are arranged in the best order for production efficiency. In the same plant mechanical engineers are designing brand new machines to accomplish special jobs—whether it's pretzel bending or filling tin cans, the engineers' slogan is "a machine can do it better" and he is just the fellow who can prove it.

We have already mentioned the Diesel branch of mechanical engineering. Very recently Charles Kettering, General Motors research genius, expressed his amazement at the rapid growth of a Diesel manufacturing plant erected by his company.

"We planned to staff it with 350 men," he said, "and now we're employing more than 3,000."

The modern high-speed Diesel engine is only about ten years old and its applications for marine purposes, in streamlined trains, in heavy trucks and tractors, and particularly in private power-generating plants, have shown amazing increases. It isn't rendering all other engines obsolete, however. There's plenty of work left for engineers in improving it. Can you reduce the weight, get rid of some of the smell, quiet it and make the most efficient small Diesels easier to start? The field's there for you.

Air-conditioning and mechanical refrigeration are other appealing young specialties for the engineer and technician. But one thing to keep in mind about these new industries is that you aren't the only man to be attracted by them. The appeal of a new specialty is so strong that hundreds of men leap in to get on the ground floor. This means that you'll face competition just as you would anywhere else—maybe a little more. So strip the glamour away from the field that attracts you, study it realistically by making inquiries and reading up on it at your library, and when you decide to go ahead, get the best training you can swing.

The job of a mechanical engineer being, essentially, everything that has to do with machines, you aren't likely to catch one of those romantic assignments that often carries the civil engineer into far-off countries. You'll stick pretty close to centers of industry because that's where machines are concentrated. This means, speaking very broadly, that opportunities are concentrated in the great manufacturing areas of the north and east. But anywhere you find factories and machines you'll find mechanical engineers.

It's time now to return to Bill Smith, who, having satisfied himself that he passed the aptitude test, bobs up with some pertinent questions:

"How can I get a job once I've got my training? And how much money can a mechanical engineer expect to make?"

Not always as much money as he is worth. Many competent engineers are paid off partly in prestige. On the other hand, topnotchers can reach juicy five-figure salaries, and since engineering is one of the straightest roads toward an important executive office in big business, many a man who started out to be an engineer has wound up in a "sky's the limit" administrative spot.

To be specific, the beginning salary of an engineering graduate will rarely be less than $25 a week—and not a great deal more. As he proves his ability his salary keeps pace and after four or five years he should be drawing $50 a week. Ten years out of college and he will probably average from $3,500 to $4,500 a year, having found his niche in some specialty. Many able men do not rise much above $3,000 a year.

But don't underestimate the value of the prestige we mentioned. The community rates the engineer highly; he's invariably respected and admired. Any engineer worth his salt loves his work and finds compensation in that fact. As far as professional ability goes, the $3,000 a year man many rank even higher than the $50,000 a year vice president who started out with him. Much of the difference is explained by personality qualities analyzed in the aptitude chart. And those same personal qualities affect the business of landing a job.

What is the one quality prized above others in jobseekers? Big business men who employ hundreds of engineers stated it succinctly in a recent conference:

"The ability to work smoothly with others."

Along the same lines, a great engineering college recently made a survey of graduates who had been out of school for one year. Only 20% of these had not found jobs. Strangely enough, these men had made higher marks in school than the 80% who were at work. But the unemployed group had been "grinds," had taken no part in extra-curricular activities.

"Boyoboy!" exclaimed Bill Smith as these figures sank in. "Am I glad that I sold ads for the school yearbook, and all those other outside jobs I did. I learned to meet people and to talk easily with 'em—putting myself over, I suppose you'd call it—and that ought to help in landing a job."

It unquestionably will. A jobhunter is a salesman, selling himself. Have you ever made an effort to get acquainted with men in the industry that attracts you? They're wrapped up in their work and love to talk about it. They'll think of you as that bright young fellow with a head on his shoulders, and if they haven't jobs to give themselves they will know plenty of men in their field who may have openings. A word of commendation from a "contact" like that can work miracles in opening doors.

If you attend an engineering college, you will be scouted by various big corporations who make

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a practice of hiring a certain percentage of new men each year from graduating classes. Schools, technical colleges and many correspondence training schools maintain regular placement services for their students; many employers turn to them for likely material. Engineering training qualifies you for such a specialized and specific jobs that placement is generally much easier than in the case of non-technical men.

Broadly speaking, you'll have to work for a company or corporation, since machinery in the mass isn't small time business. But a chosen few wind up in business for themselves as consulting engineers. This comes after years of experience when you've built up a reputation as an expert along certain lines. When you reach that stage your income can be as large or as small as a corporation lawyer's.

And it's a great feeling to realize that engineers leave a more permanent imprint on the world than any other group you can think of. It was mechanical engineers who built the pyramids!

Income Chart for MECHANICAL ENGINEERS

Beginning salaries for qualified engineers	$25 a week (often higher)
After four or five years' experience	$50 a week
After ten years' experience, development of a specialty	$3,500 a year

These are minimum figures; maximum incomes cannot be calculated accurately because there is the same great spread that you will find in the incomes of physicians, lawyers, and other professional men. The engineering branch you specialize in will affect the income greatly.

Microscope Opens New Fields

[*Continued from page* 131]

different technique for preparing and handling specimens has therefore been developed. This work was pioneered by Dr. Marton. The specimen is placed upon a film of nitro-cellulose only one-millionth of a centimeter thick which is stretched over an extremely fine wire mesh.

Since even air is composed of vast numbers of large molecules that hinder the passage of the electron beam, the interior of the microscope is evacuated of all air by a vacuum pump. The specimen is introduced into the microscope through a specially designed air lock that in action resembles the escape chamber of a submarine. A somewhat similar airlock chamber is used to introduce the photographic plate into the microscope without disturbing the vacuum within the instrument.

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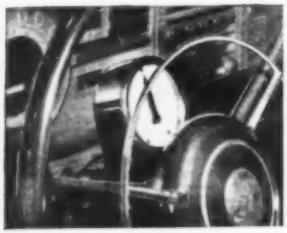

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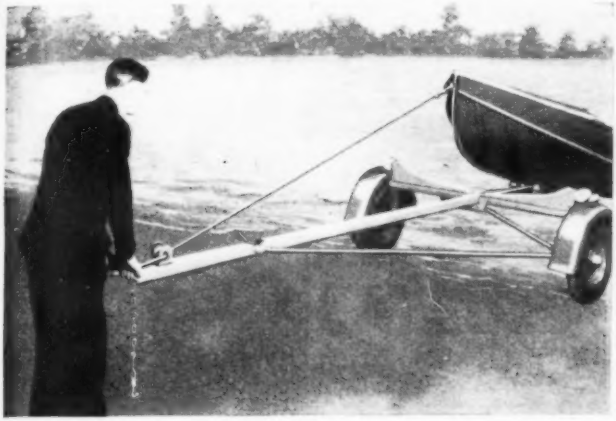

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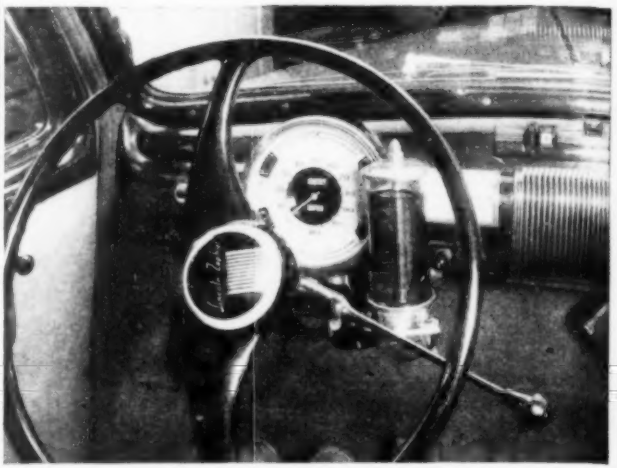
The newest thing in apartment house "visitor telephones" is a signal light device that flashes on when the visitor opens the downstairs door. It eliminates the embarassing situation that occurs when a guest misses the "come in" buzz of the electric door locks. With this innovation the resident definitely knows when visitor enters.

Tester Takes Guesswork from Gas Mileage



More miles per gallon are assured the car owner who equips his car with this new mileage tester, a simple, sturdy device which attaches to the instrument panel. Turning a small lever one way permits engine intake suction to draw fuel into the glass container of the tester, while turning the lever to the opposite direction permits the carburetor to feed from this test supply. Graduations marked inside the tester tell the driver just how much fuel the engine is consuming at the speed traveled and under the given set of conditions at the time of the test.

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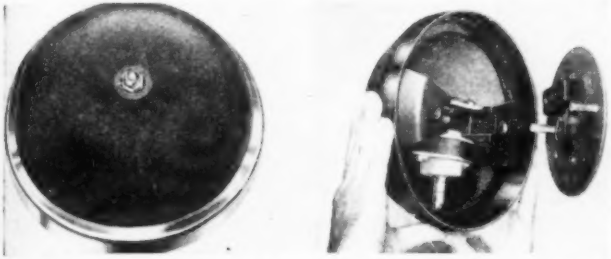
New Alarm Bell Plugs in Wall Socket



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No preheating is necessary with this soldering tool. It heats instantly when the bi-carbon tips touch the terminal or wire to be soldered. The heat stops immediately when the contact is broken, and the tool may be laid down without fear of scorching. A transformer reduces the line current to a harmless voltage for the operation of the apparatus, no current being used except during the actual work.

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UNQUESTIONABLE Superiority! Hollywood's Strokemaster. America's Premier Tennis Racket. De luxe Model, Chrome Gut $17.50. The Racket of the Age! Kent's Century Tennis Racket Evertite Silk Gut—Astounding 100th Anniversary value $6.95. Cash $2.00, balance C.O.D. Parcel Post Insured. H. F. Kay, 404-M, West Park Ave., Tampa, Florida.

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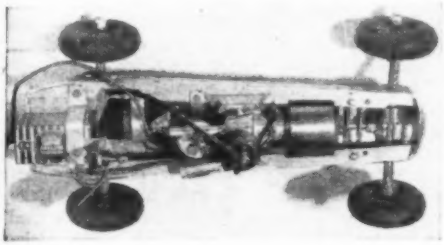
Build "Wee Willie"

[*Continued from page 88*]



This view of the car with the body snapped off shows the extremely compact arrangement of motor, flywheel, gears, battery, switch, etc. Note holes drilled in axle housings for lubrication.

chassis as nearly all combinations differ. Shape the edge of the cockpit with a wooden hammer and block since metal will leave dents, and screw the back of the hood to the turtleback. The body is completely removable, as shown in the photographs, and is snapped into position instantly with the aid of a snap catch situated on the end of the chassis, and the slots which are riveted to the near front section of the chassis. The oil pan is made in much the same manner as the hood, with the exception that it is mounted by bolting it to the pan arm. Cut a section out of the oil pan so that the flywheel will protrude slightly. This makes it possible to start your car with the rear wheel of a bicycle.

Drill two holes on the left side of the chassis to permit anchoring of the bridle. Bend the bridle from 1/16" steel wire and make it extend about nine inches from the centerline of the car. A 20-foot length of good grade picture cable will serve as an excellent tether line, since it can very easily stand the tension created by any 2½-pound car traveling in the neighborhood of 40 m.p.h.—which, incidentally, is proportional to a speed of about 300 m.p.h. in a full-sized racing car.

BILL OF MATERIALS

½"angle aluminium or dural 4 ft. length. For chassis rails, battery and coil bands, etc.
3"x6"x.062 hard sheet brass. For chassis plates, motor lug extension, twin bearing braces
15" of ⅜" O.D. (¼" I.D.) hard brass tubing. For axle housing
20" ¼" diameter drill rod. For axles, shaft extension
3 doz. ⅛" round head aluminium rivets
½ doz. ¼" length flat head copper rivets. For front chassis plates joining, motor lug extension joining
1 12x12x.032 sheet aluminium oil pan, hood
4 2½" diameter Veit airwheels
1 Matthews coupling. For motor extension unit
1 set of Boston steel bevel gears No. LI47 or equivalent
2"x4"x12" hard balsa or pine. For turtleback
1 doz. ¾" length nuts and bolts. For motor attachment
1 Burgess 3 volt battery (small)
any small bore motor
1 10 ounce flywheel (1½" diameter)
4 8-32 acorn nuts
2 Ball bearing (thrust type) Nice No. A05
threading dies, toggle switch, hook up wire, solder, strainer meshing, paint, screws, etc.

Full size blueprints of *Wee Willie* are available for $1.00 postpaid. Send check or money order to Fawcett Publications, Inc., Greenwich, Conn. Specify Blueprint No. 321.

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ALL PARTS FINISHED—ONLY A SCREWDRIVER NEEDED
AVERAGE ASSEMBLY TIME 30 MINUTES.

GHQ MOTORS, 40A East 21 St., New York, N. Y.

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ATTACH THESE SIX INCH TOOL STEEL CUTTERS IN PLACE OF SAW CUT DESIGNS SHOWN AND MANY OTHERS. Moulding Cutters A1" **$1.25**, A1½" **$1.50**. Jointing Cutters B1" **$1.25**, B1½" **$1.50**. Groove Cutters C or D 3/16", ¼" or 3/8" **$1.25** Each. Cove and Quarter Cutters E1" **$1.25** E1½" (BLADES ¾" STOCK) **$1.50**.

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IT'S REALLY YOURS for $2.95

DUTY ADDED IN CANADA

Daisy Mfg. Co. 567 Union St. Plymouth, Mich. U.S.A.

A Weatherproof Lawn Set

[*Continued from page 91*]

Construction of the table is somewhat like that of the chairs, except that the hoops are on the outside of the legs instead of inside. They are of the same material as in the chairs, and are lap-jointed over a leg and secured with a dowel, or a screw with head countersunk and concealed with wood putty. The chairs are designed to slide under the table top and inside of the drip line of a 7-foot umbrella, to keep the seats dry in case of sudden showers. It is not necessary to cover them in the rain, otherwise. Half-inch outdoor plywood (super-harbord) is used for the table-top, cut in a 48-inch circle. Holes are bored for the umbrella staff, which should be loose enough to lift out when required. The table legs are arranged to give a stable base without interfering with the feet of persons sitting at the table.

The Red Rocket Racer

[*Continued from page 89*]

the wing blocks except that they have no holes in them.

Any wooden toy or model airplane wheels of the proper diameter will be satisfactory. The plane should be painted as indicated for the best appearance. To fold the wings, first bend them up and then back to the tail. They may be held straight up by a rubber band at the tips. To fit into the hangar, of course, they must be folded back and fitted into the slots provided in the tail. —*D. W. Clark.*

Turning Coal Into Flowers

[*Continued from page 41*]

fish bowl, adding a little iodine, a bit of mercurochrome, salt and water. He found that in twenty-four hours he had a permanent garden of a flower-like fungus growth in all sorts of rainbow shades. He later experimented by adding various household chemicals and found it possible to obtain all sorts of shades. After a few lumps of coal are put in a fish bowl, he adds water, salt and bluing. Iodine, mercurochrome, ammonia and alcohol are added with an eye dropper. For green shades, sulphate of iron is used, potassium bichromate for red and copper sulphate for blue. The ammonia acts as an accelerator, as does the salt. Alcohol yields an orange color, iodine gives white effects and mercurochrome pink hues.

Mallor claims it is necessary to feed his plants just "like a baby" with fresh doses of chemicals every few hours. However, when the plant reaches maturity in a day or so, it is permanent and requires no further treatment. They make ideal gifts for shut-ins and Pat Mallor finds so many requests for his unusual coal flower gardens that each new one he makes finds a waiting home.

Fisherman's Tackle Cabinet

[*Continued from page 96*]

lower end of the vertical partition is nailed to the bottom of the cabinet from the underside.

The door consists of a plywood panel 19-in. wide and 47-in. high, with a ½-in. pine frame fastened around the front as shown. Saw out and finish the frame pieces 2-in. wide, mitering the corners and fastening them to the plywood panel with screws from the panel side, or back, leaving the front smooth. Use small cabinet butts for the three hinges, attaching half the butt to the front edge of the cabinet and the other half to the adjoining edge of the door. Three hinges will tend to keep the door from warping. A cupboard turn is fastened to the other edge of the door and adjoining edge of the cabinet.

Cut out ½-in. pine 3-in. wide and 12-in. long for the two feet or rests, fastening them with screws to the bottom of the cabinet and countersinking the screws to protect varnished floors if you set up the cabinet in your den. If you wish, fill any rough edges of plywood around the door, or screw and finishing nail holes, with putty or plastic wood. Sandpaper the finished cabinet and stain to match den furniture, finishing with a coat of clear lacquer or varnish. The remainder of the plywood in the two sections can be utilized in making trays or boxes in which to stow small gear on the cabinet shelves.

About four dollars will cover the cost of pine and plywood, with an additional fifty cents for cupboard turn, hinges, nails and screws. However, pine pieces for the door panel frame and foot boards can easily be cut from a large packing box. Pine strips can be substituted for the molding braces, and wide pine scrap boards, long enough to construct the cabinet frame, will reduce the expense item. If the cabinet is placed "upstairs" however, you will want to use good white pine, plywood, and fittings on the cabinet. The total cost should not exceed $5.00 for a first-class cabinet, ranging down to $2.50 where scrap pieces are utilized.

"Rollawn"

[*Continued from page 84*]

1 Piece strap iron 69"x1¼"x¼".
1 Piece strap iron 34"x1"x¼".
2 Pieces strap iron 24"x1"x¼".
1 Piece cold rolled shafting 34"x⅞".
2 Pieces 1-in. pipe two inches long.
2 Pieces strap iron 14"x1"x⅛".
Wood for handles.
Wood for motor platform.
Bolts and screws for assembly.
Lauson ¾ h.p. Model RLC or similar motor.

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Wren House "For Rent"

[*Continued from page 102*]

roof. Saw out the boards as shown, the pointed section starting 3½" from the bottom of the block. Whittle a curved scroll in the lower edge as shown, the distance from the floor, indicated by dotted lines, and the bottom of the block being ¾". Each side piece is ¾" thick and 2¾" wide and 3½" long. Saw out the floor piece to measure 3" wide and 3½" long. The position of side and floor pieces are shown by dotted lines in the front view. Nail the front and back pieces to the side boards, using finishing nails about 2" long. The floor block should slip snugly in place between the side boards, where it is held by two wood screws at the front and back. Bore small holes through the front and back pieces for the screws. When you wish to clean out the wren house between summer seasons, simply remove the screws and the floor can be taken out. Bore a hole ⅞" in diameter for the door, placing it about 1½" or 1¾" above the floor. The door *must be no larger*, or it will let in the wrens' worst enemies, the sparrows. Bore a small hole 1" below the door, and drive a dowel or rounded peg, ¼" thick and 2" long, in the hole, to serve for the perch. The two roof boards are cut out of a board ¼" or ⅜" thick, and each board is 4¾" wide and 5½" long. Plane down the edges of the roof boards where they meet at the top, to form a tight joint or bevel, as shown in the front view. The position of the front and back pieces and the floor are shown by dotted lines in the side view. From boards or lathe ¼" thick, 1" wide and 5" long, whittle out the curved front roof boards, or facing. There are four such boards, cut to fit at the top and nailed with small finishing nails to the edges of the roof at front and back. Cut out a strip of tin from a flattened tin can, ½" wide and 5½" long, and bend it in the shape of a trough to fit over the top of the roof, tacking it in place. The chimney block is about 1" square at the ends and from 1½" to 2" long. Saw a notch in one end to fit over the edge of the room, nailing it in place. Fasten a large screw-eye or ring in the top of the block, and attach the house to a tree limb with a short length of wire. The house can be nailed directly to the side of a building if you wish. In painting or staining the house after it has been sandpapered, a brown or green roof is suggested, red chimney and the remainder of the house white, except the perch which *must* be painted black. Or you can stain the roof and walls brown, with white ornamental facing at the ends of the roof, and white chimney. You are sure to have "tenants" if you put out these cozy wren houses "for rent."—*G. Everett Van Horn.*

Otters enjoy sliding down hill, and deliberately make a snow or mud slide just for the fun of going down it.

Horn In On Horncraft

[*Continued from page* 107]

horn but demands careful and patient work in finishing, as a smooth surface is essential. The utility of this little convenience can be greatly enhanced if the horn is worked down to flexibility.

Rings of practically any size can be made from a horn as illustrated in Fig. 4. The shapes can be somewhat varied as indicated in Fig. 6. Even more elaborate modifications are possible through the careful use of the tools. In the case of rings, also, the design of the ornamentation may be given greater latitude by boiling. The finish is subject to taste and may include color, as paint can be applied over the varnish.—*A. B. Iverson.*

Wrapping Fishing Poles

[*Continued from page* 97]

the gadget anywhere—therefore it can be carried along with the regular fishing equipment to do repair jobs when needed. By fastening it securely, both hands are left free to hold the rod or pole. After the thread is wound tightly it should be shellacked for added protection.—*R. F. Kaiser.*

A Tight Screening Job

[*Continued from page* 103]

taken to have both sides alike. The screening is then laid on the door and each end firmly tacked. When the pressure is released and the door returned to normal it will be a smooth job and all that remains to be done is to nail the edges and add the moulding.—*W. M.*

Toadstool Garden Seats

[*Continued from page* 102]

In two or three days the pipe can be removed and the earth dug out around the hole. Pull out the moulded toadstool and finish off the surface with a 1 to 1 mixture and otherwise make it look "arty." Bury the stem in the ground, so the top is seat-high.—*L. B. Robbins.*

Kinks For Bicyclists

[*Continued from page* 85]

in position. The eccentric clamp, or cam is shown in the upper illustration in the locked position. To remove the bike or place it in the repair stand, it is necessary merely to turn the clamp to the open position. The extra seat illustrated is simple to make and offers a safe passenger accommodation.

A chemical derived from castor oil is being used, in combination with a small amount of pyrethrum, as a new fly spray.

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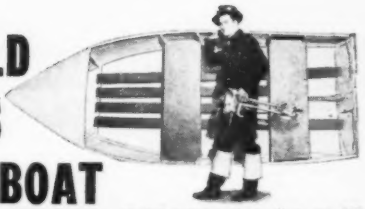

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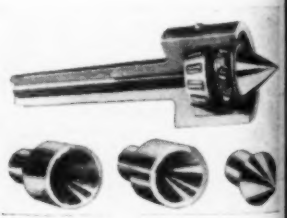

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